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REPORT TO CONGRESS

REIMBURSEMENT OF SOLE COMMUNITY HOSPITALS UNDER MEDICARE'S PROSPECTIVE PAYMENT SYSTEM

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REIMBURSEMENT OF SOLE COMMUNITY HOSPITALS UNDER MEDICARE'S PROSPECTIVE PAYMENT SYSTEM

EXECUTIVE SUMMARY

Under the Prospective Payment System (PPS), certain hospitals have been designated as Sole Community Hospitals (SCHs). These hospitals are the dominant providers of hospital services in their local communities. In order to qualify for SCH designation, regulatory provisions provide that a hospital must be in a rural area and meet one of the following conditions:

1) The hospital is located more than 50 miles from other like hospitals;

2) The hospital is located between 25 and 50 miles from other hospitals and meets one of the following criteria:

    a) No more than 25 percent of the residents or (if data on general resident utilization are not available) no more than 25 percent of the Medicare beneficiaries in the hospital's service area are admitted to other like hospitals for care;

    b) The hospital has fewer than 50 beds and the intermediary certifies that the hospital would have met the above criterion (2a) were it not for the fact that some beneficiaries or residents were forced to seek care outside of the service area because specialty services were unavailable at the community hospital;

    c) Because of local topography or periods of prolonged severe weather, the other like hospitals are inaccessible for at least one month out of each year;

3) The hospital is located between 15 and 25 miles from other like hospitals and because of local topography or periods of prolonged severe weather conditions, the other like hospitals are inaccessible for at least one month out of each year.

There are two unique reimbursement features of SCHs under PPS law. Sole Community Hospitals will be reimbursed at 75 percent of the hospital-specific rate and 25 percent of the applicable regional rate indefinitely. Furthermore, a SCH is eligible for additional payments if it experiences

more than a 5 percent decrease in its total discharges over a one year period due to extraordinary circumstances beyond the hospital's control. The Omnibus Budget Reconciliation Act of 1986 extends for two years beyond the phase-in period for PPS the provision of additional payments to SCHs that experience a 5 percent decrease in volume.

This report provides descriptive findings on the characteristics of Sole Community Hospitals, analyzes their definition and reimbursement methods, and provides recommendations for Congress on the future treatment of SCHs.

Rural SCHs are smaller and are located in more sparsely populated areas than other rural hospitals. However, the proportion of their patients who are Medicare eligible is about the same as for other hospitals. Rural SCHs also provide on average almost the same mix of ancillary services as do other rural hospitals. However, the occupancy rate for SCHs is lower than for other hospitals. As a result, the unadjusted cost per admission for rural SCHs is much higher than for other rural hospitals, and their average cost per day is as high as for urban hospitals.

There are differences between those Sole Community Hospitals that received their designations before PPS and those that were newly designated under PPS. The SCHs with older designations tend to be located in even less densely populated areas, are smaller, have lower occupancy rates, offer a smaller range of services, and have higher costs. Also, a much lower percentage of these SCHs that were grandfathered into PPS are located in the West North Central region.

Rural hospitals have far higher rates of government ownership than do other hospitals. Their cost situations may be one important reason for their greater government dependency. Rural SCHs have substantial amounts of unused capacity, either because it is considered necessary for stand-by use, or because the service simply cannot be provided on a smaller scale. Public support is therefore needed to support this capacity.

The use of service area criteria to define SCHs must involve some decisions that are arbitrary in terms of the exact thresholds used to define distance or market shares. Empirical research on travel times can provide a general sense of reasonable distances, but cannot provide specific values to be used in regulations. However, the limits contained in the SCH criteria

would appear to allow hospitals to become eligible for SCH status under reasonable conditions. These conditions are that the hospital is the dominant provider of health care in its area, and the time that would be spent in travel to an alternative hospital would be clearly longer than the average travel time for patients in other areas where the choice of hospitals is more plentiful.

The specific criteria for designation of SCHs do not have any precedent in previous regulations. However, earlier nonbinding guidelines and previous planning standards contain limits that are similar to those contained in the PPS regulations.

There is a large variance of costs around the average for Sole Community Hospitals, and possibly as many as a third of SCHs would receive higher levels of payment from the federal rate for their region than from the 75%-25% reimbursement rate formula. This comparison may motivate some of them to consider opting out of their special status.

Rural SCHs, as of 1981, were operating at 49% capacity, with 1-out-of-3 below 40%. Moreover, 1-in-4 had volume declines of more than 5% in a typical year. The same was also true of other rural hospitals, despite their higher (56%) occupancy rates. Only when a 10% threshold was used did we find that SCHs were uniquely vulnerable to volume declines compared to other rural hospitals (15% of SCHs versus 10% of other rural hospitals in the typical year).

Furthermore, the vast majority of SCHs experiencing large volume declines also had offsetting, large increases in subsequent years. About 3-in-10 SCHs potentially eligible for volume protection would have enjoyed at least two years of large volume increases over just a five year period.

The administrative determination of a hospital's fixed costs and whether a volume decline was due to extraordinary circumstances require an expenditure of HCFA and hospital resources and will result in determinations based partly on judgement and subject to appeal. Simulations of PPS cost impacts due to SCH volume protection for all volume declines beyond the 5% threshold indicate that annual outlays would be very minor (i.e., $5-10 million)

relative to the program as a whole, although amounting to as much as 5% of total annual costs for eligible SCHs. Simulations using a 10% threshold reduced the outlays by about one-third. Finally, simulations using a positive volume offset might actually result in net transfers from SCHs to the government, as large volume increases exceeded decreases between 1977-81.

For the definition of Sole Community Hospitals, HCFA recommends that

- the general SCH criteria be retained largely in their present form, and that
- the Prospective Payment System retain the provision grandfathering in those hospitals that had already received SCH status prior to the implementation of PPS.

As for the basic reimbursement formula, HCFA recommends that

- the current 75 percent hospital-specific rate/25 percent federal rate reimbursement formula be retained; however, after the transition, the federal rate would be the national rate rather than regional rates.

HCFA recommends the following changes regarding the volume shelter reimbursement mechanism:

- the SCH volume shelter continue to be triggered at the 5% threshold;
- provisions be established to recover volume shelter payments from those SCHs that were assisted when they experienced large admission volume increases during the two-year period following the year of large admission volume declines.

The recovery provision would provide a form of self-insurance, with short-run "borrowings" for declines being paid back (as least partially) in future years. This would contribute to the financial needs of other SCHs in financial distress and result in smaller budgetary outlays overall.

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REIMBURSEMENT OF SOLE COMMUNITY HOSPITALS UNDER MEDICARE'S PROSPECTIVE PAYMENT SYSTEM

1.0 INTRODUCTION

1.1 SCH Designation

Under the PPS, certain short-term general hospitals are to be reimbursed somewhat differently than the majority of institutions. One such group includes the Sole Community Hospital (SCH) who

> by reason of factors such as isolated location, weather conditions, travel conditions, or absence of other hospitals, is the sole source of inpatient hospital services reasonably available in a geographic area to Medicare beneficiaries (42 Code of Federal Regulations, Section 412.90(a)).

Sole Community Hospitals, unlike Rural Referral Hospitals which form another special group, predate PPS. When HCFA established the routine cost per diem limitation under Section 223 of the 1972 Social Security Amendments, it exempted a class of SCHs--both urban and rural--out of consideration for the beneficiary. This was done to protect against additional charges for which the hospital could legally bill the beneficiary to cover the Medicare routine cost penalties (SSA, Title XVIII, 1866 (a)).* It was thought that beneficiaries using SCHs had no realistic alternative for inpatient care and thus could not avoid any additional charges the hospital might choose to impose in compensation for the routine penalties. In point of fact, no hospital, SCH or otherwise, ever made any such impositions.

All of the original 259 SCHs are grandfathered into the new SCH category under PPS, including some urban ones. Additional SCHs were made eligible according to the following conditions (42 Code of Federal Regulations, Section 412.90(a)):

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*1866 (a)(2)(B)(ii) "Where a provider of services customarily furnishes an individual item or services which are more expensive than [those] determined to be necessary in the efficient delivery of needed health services under this title..., such provider may (except with respect to emergency services...) also charge such individual...for such more expensive items or services to the extent that the costs of...such...services...exceed the cost of such...services determined to be necessary in the efficient delivery of needed health services, but only if--(I) the Secretary has provided notice to the public of any charges being imposed on individuals..., and (II) the provider of services has identified such charges...as charges to meet costs in excess of the cost determined to be necessary...." No hospital ever billed for such additional charges, however, due to the implied admission of inefficiency in subsection (II).

1) The hospital is located more than 50 miles from other like hospitals;

2) The hospital is located between 25 and 50 miles from other hospitals and meets one of the following criteria:

    a) No more than 25 percent of the residents or (if data on general resident utilization are not available) no more than 25 percent of the Medicare beneficiaries in the hospital's service area are admitted to other like hospitals for care;

    b) The hospital has fewer than 50 beds and the intermediary certifies that the hospital would have met the above criterion (2a) were it not for the fact that some beneficiaries or residents were forced to seek care outside of the service area because specialty services were unavailable at the community hospital;

    c) Because of local topography or periods of prolonged severe weather, the other like hospitals are inaccessible for at least one month out of each year;

3) The hospital is located between 15 and 25 miles from other like hospitals and because of local topography or periods of prolonged severe weather conditions, the other like hospitals are inaccessible for at least one month out of each year.

1.2 SCH Reimbursement

During the transition phase of PPS, all covered hospitals are being paid a combination of their own hospital-specific rate and the federal rate, as described in 42 Code of Federal Regulations, 412.73. Both portions of the rate are adjusted by the DRG weighting factor for each individual case. The federal rate is a blend of national urban or rural standardized amounts and regional urban or rural standarded amounts for each census division. Thus, the federal rates are determined from a matrix of standardized amounts consisting of 20 cells: national plus 9 census divisions, for both urban and rural areas. The chart on the following page summarizes the changing percentage combinations of the hospital-specific rate versus the federal rate during the transition phase of PPS. The chart also shows what percentage of the federal portion of the PPS rate is based on regional data and what percentage is based on national data.

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*The term "miles" is distance measured over improved roads. "Like hospital" means hospitals furnishing short-term acute care.

SUMMARY OF HOSPITAL-SPECIFIC AND FEDERAL PERCENTAGES

Cost reporting period Beginning on or after	Hospital-specific percentage	Federal percentage
October 1, 1983	75	25
October 1, 1984	50	50
October 1, 1985		
- The first seven months of the cost reporting period	50	50
- The remaining five months of the cost reporting period	45	55
October 1, 1986	25	75
October 1, 1987	0	100

SUMMARY OF REGIONAL AND NATIONAL PERCENTAGES OF THE FEDERAL PORTION

Federal fiscal year beginning	Regional percentage	National percentage
October 1, 1983	100	0
October 1, 1984	75	25
October 1, 1985	75	25
October 1, 1986	50	50
October 1, 1987	0	100

While not exempt from PPS, SCHs are treated quite differently in two respects (see 42 CFR 412.92):

(1) SCHs are to be reimbursed indefinitely using the 75/25% hospital-specific/federal-regional weighting method; the 25% federal-regional portion is 100% regional rates and 0% national, and this mix does not change during or after the PPS transition period; and

(2) for hospital cost reporting periods between October, 1983 and September, 1986, SCHs will receive additional reimbursement for decreases in discharges beyond their control exceeding 5% of total discharges in the preceding reporting period.

To qualify for a volume adjustment, the hospital must (a) submit documentation to the intermediary demonstrating the size and cost implications of the volume decline, and (b) identify the extraordinary circumstances (e.g., strikes, floods, earthquakes, fires, inability to recruit essential physician staff, prolonged severe weather conditions) beyond the hospital's control. The 75% shelter against the national payment rates is to run in perpetuum. The Omnibus Budget Reconciliation Act of 1986 extends for two years beyond the phase-in period for PPS the provision of additional payments to SCHs that experience a 5 percent decrease in volume.

Like other qualifying rural hospitals, SCHs may apply for recognition as Regional Referral Centers or as Swing Bed Hospitals (SBHs) if they meet qualifying criteria. Fifteen of the 363 SCHs were also designated RRCs as of October 1985. As such, the Federal share (25%) of their rate is paid at urban levels. Likewise, 90 SCHs were Swing Bed Hospitals. This feature permits compensation of these hospital for Medicare SNF services in qualifying cases. The RRC and SBH qualification criteria are mutually exclusive.

1.3 Designation and Reimbursement Issues

When hospitals began being penalized for excessive routine costs in 1973, SCHs were exempted out of a concern for Medicare beneficiaries who might be charged extra for their care or turned away altogether. Without a reasonable alternative the incidence of the penalty could fall disproportionately on the elderly. Congress apparently maintains this concern although providers are not totally sheltered as they were under the section 223 regulations.

1.3.1 Determining the Appropriate Market Area

Do the SCH designation criteria represent an appropriate market area for

granting exemptions? If patient travel-for-inpatient-care patterns indicate greater travel distances on average than specified in the regulations, then fewer SCHs may be appropriate. On the other hand, if travel distances tend to be far shorter, then more SCHs should be considered for exception.

Regarding the provider, SCH exception from the 223 regulations meant little to the majority of non-exempt providers incurring no penalties. This is no longer true under PPS, where a 75% sheltering against the federal rate is potentially very advantageous to a number of high cost SCHs. Equity to providers as well as beneficiaries therefore demands careful scrutiny of the new regulations.

Another designation issue concerns the grandfathered SCHs. Are their market areas sufficiently different from those of newly designated SCHs such that many would not qualify under the new regulations? If so, a thorough review of their grandfathered status is warranted.

1.3.2 Establishing the Utilization Shelter

Presuming a case can be made for maintaining the SCH designation, two reimbursement issues deserve further consideration. First, what is the rationale and appropriate method for sheltering SCHs against unexpected, uncontrollable volume declines? No other hospitals are being afforded such utilization protection, which makes the rationale a contentious issue. Subsidiary, more technical, questions include: how arbitrary is the 5% threshold? Over what period should the change be calculated? Are there ways of formulizing the adjustment to assure interhospital equity and minimize intermediary burden?

1.3.3 Extending the 75 Percent Shelter

A second reimbursement issue concerns the 75% hospital-specific shelter in perpetuum. This criterion has no basis in previous law or Medicare cost-finding, appearing mainly to be a pragmatic compromise between full versus no exception. Because the dollars involved are potentially large--at least to those institutions so designated—a careful analysis of the relative performance of SCH versus other rural hospitals is in order. Questions to be addressed include: should this 75% shelter against PPS be altered, either partially or in toto?; and if no strong rationale exists for perpetuating the shelter in general, are there some remaining cases that might pose material harm to beneficiaries that could be handled on a case-by-case basis?; if so, how?

1.4 Summary of Findings on Policy Issues

1.4.1 The Need for an SCH Designation

Rural SCHs are smaller and are located in more sparsely populated areas than other rural hospitals. However, the proportion of their patients who are Medicare recipients is about the same as for other hospitals. Rural SCHs also provide on average almost the same mix of ancillary services as do other rural hospitals. It therefore appears that most communities served by SCHs are not just receiving "custodial" hospital care. However, the occupancy rate for SCHs is lower than for other hospitals. As a result, the unadjusted cost per admission for rural SCHs is much higher than for other rural hospitals, and their average cost per day is as high as for urban hospitals.

There are differences between those Sole Community Hospitals that received their designations before PPS and those that were newly designated under PPS. The SCHs with older designations tend to be located in even less densely populated areas, are smaller, have lower occupancy rates, offer a smaller range of services, and have higher costs. Also, a much lower percentage of these SCHs that were grandfathered into PPS are located in the West North Central region.

Before PPS, Sole Community Hospital designations were made at the regional level. As a result, the difference in the regional location of pre-PPS and post-PPS SCHs may be the result of the previous use of varying criteria reflecting regional or local circumstances. Alternatively, local hospital associations have been more active in encouraging SCH applications. In any event, the grandfathered SCHs appear on average to be appropriate members of the Sole Community Hospital category. The implicit criteria used to make the regional decisions on SCHs prior to PPS may have even been more stringent than the explicit criteria in the PPS regulations. However, our data do not contain the detail necessary to test this possibility.

Rural hospitals have far higher rates of government ownership than do other hospitals. Their cost situations are one important reason for this higher rate. Rural SCHs have substantial amounts of unused capacity, either because it is considered necessary for stand-by use, or because the service simply cannot be provided on a smaller scale. This excess capacity will lead

to negative margins on patient revenues. Indeed, the average margin on patient revenues for rural SCHs is -5.5 percent.

In order for the hospital to remain solvent, support must be obtained from other sources. Our data show that in a number of instances, the service area that benefits from the existence of an SCH uses its local government as a means to support the hospital, either through direct government ownership or by government transfers. As a result, the average margin on total revenues for rural SCHs rises dramatically to +2.5 percent.

1.4.2 The Criteria for SCH Designation

The use of service area criteria to define SCHs must involve some decisions that are subjective in terms of the exact cutoffs used to define distance or market shares. Empirical research on travel times can provide a general sense of reasonable distances, but cannot provide specific values to be used in regulations. However, the limits contained in the SCH criteria would appear to allow hospitals to become eligible for SCH status under reasonable conditions. These conditions are that the hospital is the dominant provider of health care in its area, and the time that would be spent in travel to an alternative hospital would be clearly longer than the average travel time for patients in other areas where the choice of hospitals is more plentiful.

The specific criteria for designation of SCHs did not appear in previous regulations. However, earlier nonbinding guidelines and previous planning standards contain limits that are similar to those contained in the PPS regulations.

1.4.3 The 75 Percent Reimbursement Shelter

Our analysis indicates that, on average, SCHs are indeed more expensive in terms of their casemix-adjusted cost per admission, and therefore many of these hospitals will benefit from 75 percent hospital-specific reimbursement. However, there is a large variance of costs around the average for Sole Community Hospitals, and possibly as many as a third of them would receive higher levels of payment from the federal rate for their region than from the 75%-25% reimbursement rate formula. This comparison may motivate some SCHs to consider opting out of their special status.

Two factors will restrain such a move. First, the SCH would also lose protection from extraordinary declines in volume. Second, after PPS is phased in, it is not clear how adjustments will be made for inflation or for restraining program costs. SCHs might possibly be treated more or less favorably than other hospitals in these adjustments. Sole Community Hospitals therefore have some incentives to preserve their options until the future structure of PPS becomes more clear. However, after the transition period, it would seem administratively appropriate to change the 25 percent Federal rate portion to the national rate, instead of continuing to use nine regional rates only for this limited purpose.

1.4.4 Protection Against Occupancy Declines

Rural SCHs, as of 1981, were operating at 49% capacity, with 1-out-of-3 below 40%. Moreover, 1-in-4 had volume declines of more than 5% in a typical year. The same was also true of other rural hospitals, despite their higher occupancy rates (56%) . Only when a 10% threshold is used did we find that SCHs were uniquely vulnerable to volume declines compared to other rural hospitals (15% of SCHs versus 10% of other rural hospitals in the typical year).

Furthermore, the vast majority of SCHs experiencing large volume declines also had offsetting large increases in subsequent years. About 3-in-10 SCHs potentially eligible for volume protection would have enjoyed at least 2 years of large volume increases over just a five year period.

SCHs with large (5%+) volume declines exhibited fixed/average cost ratios of .60 versus .80 for hospitals with small volume declines. Hence, more costs are considered variable by SCH administrators when annual admissions fall precipitously, necessitating less cost protection.

The administrative determination of a hospital's fixed costs and whether a volume decline was due to an extraordinary circumstance require an expenditure of HCFA and hospital resources and will result in determinations based partly on judgement and subject to appeal. Simulations of PPS cost impacts due to SCH volume protection for all volume declines beyond the 5% threshold indicate that annual outlays would be very minor (i.e., $5-10 million) relative to the program as a whole, although as much as 5% of total annual costs for eligible SCHs. Simulations using a 10% threshold reduced the outlays by about one-third. Finally, simulations using a positive volume offset might actually result in net transfers from SCHs to the government, as large volume increases exceeded decreases between 1977-81.

1.5 THE PUBLIC FINANCE OF SOLE COMMUNITY HOSPITALS

Many of the issues concerning HCFA treatment of Sole Community Hospitals are basically economic questions of public finance. In moving from analytical findings to policy recommendations, it is therefore worthwhile to consider the most important of these questions:

- Why should the government give special treatment to SCHs?
- What are the types of special treatment that can be provided, and what are their advantages?
- Which level of government is the most appropriate one to provide this treatment?

There are a number of goods and services whose provision concerns society to the extent that government either subsidizes these activities or provides them directly. In the specific case of Sole Community Hospitals (and rural post offices and airports as well), this reflects a willingness to permit capacity to exist beyond those levels that are consistently utilized. Society may be willing to subsidize this excess capacity because the services provided (e.g., maternity ward, operating room) are "lumpy" and cannot be efficiently produced in very small sizes, or because the capacity is desired as part of a national hospital infrastructure for times of peak demand where alternatives are not easily available.

Congress has clearly decided that special treatment should be given to Sole Community Hospitals, but on what basis should this financial aid be provided? Special treatment could be based on (a) the capacity of the institution or (b) the needs of the community for health services. The 1978 National Guidelines for Health Planning acknowledged the desirability of a needs-based approach, but noted that realistic and useful standards could not be constructed. In contrast, the capacity of an SCH hospital to provide care is easily measured in terms of beds and/or available services.

Having justified SCH subsidization and its basis in terms of current capacity, its method of disbursement should next be considered. There are three basic methods:

- payments that are positively related to utilization;
- payments that are negatively related to the level of utilization; and

- payments that are solely related to the capacity of the facility, regardless of the level of utilization.

For payments positively related to utilization, the total payment, including any subsidy, increases as utilization increases. If the average payment per discharge exceeds the marginal cost of providing services to patients, then the SCH is given a financial incentive to expand its services.

Current regulations for the PPS system provide for payment of Sole Community Hospitals at 75% of the hospital-specific rate and 25% of the federal rate for an indefinite period. This policy provides subsidies that are positively related to utilization. If the hospital's base year costs are greater than the applicable federal rate, then SCH status will include an added payment (or protection or subsidy) relative to other hospitals under PPS to cover the SCH's hospital-specific costs. If, on the other hand, the SCH's base year costs are less than its federal rate, then the hospital will have an incentive to forego SCH status, receiving an even higher rate of payment under the regular provisions of PPS as compared to its historical rates. A drawback to a "positive" subsidy of this type, however, is that if services are not provided or equipment not utilized, then payment is not made. This approach may therefore not be an effective means of preserving unused capacity as part of the national infrastructure.

For subsidies negatively related to utilization, Congress assumes that the SCH is making a reasonable attempt to provide services and covers a reasonable portion of its costs when it does so; nevertheless, the hospital has fallen short of its target through no fault of its own. A negative utilization subsidy enables the hospital to maintain its capacity in order to meet higher rates of utilization when they occur.

Additional payments to SCHs as a result of volume declines in excess of 5% constitute such a subsidy. For good or bad, the subsidy keys on the volume level that existed before the decline, and is more-or-less independent of actual capacity. Unfortunately, if the subsidy is set too high relative to actual fixed costs, the hospital is given no incentive to cut back on truly "excess" capacity, a major drawback to any "negative" subsidy.

Finally, payments related solely to capacity (sometimes called lump-sum subsidies) represent an extreme willingness to subsidize certain services as part of the nation's infrastructure, regardless of the budgetary costs. It is

not a particularly appealing method, because SCHs doing very well would enjoy as much subsidization as those in financial distress.

1.6 The Appropriate Role of Federal vs. State and Local Governments in Supporting Sole Community Hospitals

A decision to support Sole Community Hospitals still leaves open the question of which level of government should provide aid. Economic analysis indicates that the level of government involved should cover the same area as the geographic extent of the benefits provided.* If SCHs are viewed as part of the national infrastructure, then federal government involvement is justified. If the excess capacity maintained by SCHs largely benefits only those occasional recipients of hospital services who reside primarily in the local area of the hospital, then local (or possibly state) government involvement is indicated. If both approaches are considered valid, then an involvement by more than one level of government is justified.

Medicare has always been a national entitlement program with all benefits transportable across states. The U.S. hospital industry must therefore be considered more a national than a local phenomenon as far as Medicare is concerned. However, the disproprotionate public control of SCHs reflects local preferences to assure basic acute inpatient care to residents. Without any public support--Federal or otherwise--most of these institutions would close due to underutilization.

Joint Federal-local subsidization continues under PPS, but with a difference. Some SCHs will forego their special status and enjoy the even higher Federal payment rate. For these hospitals, local subsidization may fall as they enjoy higher Medicare revenues under PPS. Alternatively, assuming local support for these hospitals continues, the higher revenues might be applied to some services, equipment, or staff. With budget neutrality, the subsidization effectively involves a transfer from other hospitals whose costs exceed the Federal rate. For SCHs with costs above the Federal rate, 25% exposure to this rate may require additional local subsidization unless operating economies can be achieved. Furthermore, while

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*See, for example, the discussion of the "correspondence principle" in Gardner (1978).

all grandfathered SCHs have enjoyed previous protection, post-PPS SCHs may receive additional Federal subsidization, thereby providing incentives to reduce the incidence of local support. At bottom, many SCHs have strong local support for their activities. Hence, changes in payment rates brought about by the new PPS regulations may produce countervailing changes in these levels of local support.

1.7 Recommendations

1.7.1 Sole Community Hospital Definition

There is no method of defining a Sole Community Hospital that does not require some arbitrary distinctions to be made. In the particular case of defining hospital market areas, this problem is complicated by the absence of an aggregate data set on service and travel patterns for a large sample of hospitals. As a result, HCFA cannot produce precise definitions against which the "distance" criteria for SCHs contained in the PPS regulations can be judged. However, comparisons of these criteria with research on travel times for hospital care and with previous regulations indicate that the SCH designation criteria are reasonable. HCFA therefore

- recommends that the SCH criteria be retained largely in their present form.

In addition to the Sole Community Hospitals that have qualified under the new PPS criteria, SCHs that received designations under the Section 223 cost limits were also grandfathered into PPS. Compared to new SCHs, these hospitals with prior SCH designations are located in less densely populated counties with approximately the same level of health care resources per person available to local residents. They have higher costs and lower occupancy rates on average, and display approximately the same amount of variation in characteristics as their newly designated SCH counterparts. Those SCHs that were grandfathered into PPS were not required to meet the new criteria for designation, but it appears that on average they are an appropriate group for

SCH designation. HCFA therefore

- recommends that the Prospective Payment System retain the provision grandfathering in those hospitals that had already received SCH status prior to the implementation of PPS.

1.7.2 The SCH Reimbursement Formula

The current reimbursement formula provides fixed payment amounts per case, which are a reasonable combination of protection and incentives. The formula is a fixed blend of 75 percent of the hospital-specific rate and 25 percent of the federal regional rate. Sole Community Hospitals continue to be paid largely on the basis of their historical costs per discharge. As a result, SCH hospitals that have high costs due to underutilization of services, low occupancy rates, or other factors, are protected from the leveling effects of the federal rate. To the extent that these high costs result from the particular mission of SCHs in serving communities that are relatively isolated from other health care providers, then this protection is in keeping with the objective of the SCH designation.

However, it should be noted that this protection is not a blank check. Sole Community Hospitals will still be paid 25 percent on the basis of the federal rate. It should also be noted that the Administration has proposed regulations under which payments to sole community hospitals could be revised to take into account factors necessary for delivery of patient care that result in significant cost distortions subsequent to the base year for PPS.

One factor that contributes to the higher costs of SCHs is low occupancy. While the 75 percent hospital-specific payment will incorporate the occupancy rates of the recent past, it will not protect against future declines in occupancy. The volume decline reimbursement adjustment can be applied to any given decline for only one year. After that, an SCH must economize in the face of whatever increases in costs may result from a permanent decline in occupancy.

Other blends of the hospital-specific and federal rates, 50-50 for example, could be utilized to reimburse Sole Community Hospitals. However, the current formula provides an SCH with most of its historical costs while utilizing enough of the federal rate to promote efficient health care delivery. But a change in the basis for the federal portion would simplify program administration. The federal portion should be the national rate rather than nine separate regional rates. HCFA therefore

- recommends that the current 75% hospital-specific rate/25% federal rate reimbursement formula be retained, but the federal portion should become the national rate rather that the applicable regional rate.

1.7.3 Volume Shelter

The Congress was correct in assuming that Sole Community Hospitals are uniquely vulnerable to large volume declines. The analyses of pre-PPS admission volume data suggest that a 10% threshold might more clearly distinguish SCH volume fluctuations from those of other rural hospitals. However, because of the great declines in rural hospital admissions since 1981, HCFA

- recommends that the 5% threshold for the SCH volume shelter be maintained.

Because admission volumes fluctuate from year to year, HCFA believes that hospitals receiving volume shelter payments but later experiencing relatively large volume increases should be expected to repay at least part of the volume shelter payment. So as not to unreasonably penalize rapidly growing or recovering SCHs, HCFA

- recommends that any reduction in SCH payments based on volume increases beyond the threshold be triggered only if the SCH has already received volume protection from declines in the last two years, and then only up to the total value of the protection.

Implemented in this fashion, the symmetrical SCH volume adjustment would act as a form of self-insurance, with short-run "borrowings" for declines being paid back (as least partially) in future years. This would contribute to the financial needs of other SCHs in financial distress and result in smaller budgetary outlays overall.

Finally, the very low occupancy rates of a majority of SCHs are disturbing. This is true even allowing for their extraordinary circumstances, e.g., isolated, low density populations and small absolute size. While it is tempting to recommend policies to specifically address this problem, several reasons exist for not doing so. First, if Congress were to approve occupancy penalties (like those formerly applied in New York), perverse incentives would be established to increase admissions, raising outlays unnecessarily. Second, the 25% exposure to the fixed Federal rate encourages some SCH cost-cutting of underutilized capacity. Third, all the evidence suggests that the cost-savings associated with bed reductions in SCHs would be minimal, as their excess beds do not appear to be generating any significant inappropriate utilization. And fourth, addressing the excess beds problem may be more correctly done by altering the way in which Medicare reimburses capital costs. The administration's proposal for paying capital costs on a prospective basis is described in the June 3, 1986 Federal Register.

1.8 Overview of the Report

Chapter 2 presents descriptive data for a variety of characteristics of Sole Community Hospitals, along with data for other rural and urban hospitals that are included for comparison. Chapter 3 discusses the difficult issues that are inherent in defining an SCH, and in defining a hospital market area in general. The next two chapters analyze the two reimbursement features of PPS that are unique to SCHs. In Chapter 4, special payments for volume declines are analyzed in detail. In Chapter 5, implications of the reimbursement method that uses a blend of hospital-specific and federal rates are explored. Finally, the sources and construction of the data are described in Appendix A.

2.0 CHARACTERISTICS OF SOLE COMMUNITY HOSPITALS

The Sole Community Hospital designation contains two geographical groups—urban and rural hospitals. The groups are distinct from a regulatory standpoint because, while rural hospitals may apply for new SCH designations, only the small number of urban hospitals that were already designated as SCHs are eligible for such status under PPS. From a functional viewpoint, the two types may be similar, because "urban" SCHs may be in rural areas of large counties that are attached to a metropolitan area. Rural SCHs can be further divided into those hospitals that obtained their designations under the old Section 223 cost limits (and were therefore grandfathered into PPS) and those hospitals that applied for and received new designations under PPS.

In the following analysis, we will present data for each of these three groups that, for the sake of brevity, will be called urban SCHs, pre-PPS rural SCHs, and post-PPS rural SCHs. For comparison, the data for other hospitals will be broken out by urban and rural location. A total of 354 Sole Community Hospitals are analyzed in this chapter. This figure represents 89 more SCHs than were studied by Farley (1984). Where the same variables are being measured, the results presented here are very similar to his work, although Farley uses different groups for comparison.

2.1 Location and Organizational Characteristics

Because population density and topography are not uniform across the United States, there is substantial variation in the location of SCHs. Table 2-1 shows that over 60 percent of urban SCHs and pre-PPS rural SCHs are located in the Mountain and Pacific regions of the U.S., even though less than twenty percent of all hospitals are located in these two regions. However, there is a substantial difference between rural hospitals with pre- and post-PPS SCH designations. A far greater proportion of new SCHs are located in the West North Central region, the region that contains the largest percentage of rural hospitals in the country.

This regional difference between those hospitals with old and new SCH designations may be due to a number of factors. Under the 223 limits, the criteria for SCH designation were largely formulated at the regional level. As a result, hospitals in some regions may have found it easier to obtain such designations. Alternatively, some regions may have had better information dissemination programs, on the part of either the HCFA regional office or hospital associations, that encouraged or assisted SCH applications.

TABLE 2-1

REGIONAL DISTRIBUTION AND ORGANIZATIONAL CHARACTERISTICS OF SCHs, 1981

	Sole Community Hospitals				Other Rural Hospitals	Other Urban Hospitals
	Urban	Pre-PPS Rural	Post-PPS Rural	All Rural		
Number of Hospitals	31	233	90	323	2,188	2,786
Region						
Northeast	6.5%	6.1%	6.7%	6.5%	2.1%	6.1%
Mid-Atlantic	6.5	0	0	0	4.6	16.7
South-Atlantic	3.2	4.4	7.8	5.3	14.1	14.9
East North Central	3.2	1.8	4.4	2.5	14.5	18.8
East South Central	0	2.6	5.6	3.4	12.7	5.2
West North Central	9.7	11.4	26.7	15.5	24.3	6.5
West South Central	3.2	10.5	6.7	9.3	17.4	12.1
Mountain	12.9	41.5	27.8	37.1	5.8	3.2
Pacific	54.8	21.8	14.4	20.4	4.5	16.5
Ownership						
Government	42%	48%	44%	47%	47%	16%
Private Non-profit	55	49	51	50	45	68
Private For-profit	3	3	4	3	8	16
JCAH Accreditation	93%	53%	57%	54%	59%	90%
Teaching Involvement						
Affiliated w/ medical school	7.1%	0%	1.0%	0.3%	0.4%	24.6%
Member COTH[a]	3.6	0	0	0	0.1	10.7
Residents per 100 beds	1.6	0.0	0.0	0.0	0.2	5.2
Affiliated w/ nursing school	0	0	0	0	0.9	9.7

[a] COTH = Council of Teaching Hospitals

Sources: American Hospital Association Annual Survey of Hospitals, Medicare Cost Reports, and Area Resource File.

The combination of PPS uniform criteria and the heightened incentives of the PPS payment formula may have induced more hospitals to seek exemption than was the case under cost reimbursement. The data presented on the following pages cannot indicate the cause of the difference in regional distribution between pre-PPS and post-PPS rural Sole Community Hospitals. However, the analysis can show whether there are important differences between the two groups that relate to the appropriateness of the SCH designation.

Rural hospitals in general have a substantially higher level of government ownership than do urban hospitals, but there is no difference between old and new rural SCHs and other rural hospitals. In this aspect of ownership, urban SCHs are similar to rural SCHs and distinctly different from other urban hospitals. Private non-profit ownership is more likely in Sole Community Hospitals than in other rural hospitals, but less likely than in urban hospitals. Finally, all three types of SCHs have much lower rates of for-profit ownership than do other hospitals.

These differences in ownership are most likely a reflection of the financial and market factors that underly the SCH designation. The market for a Sole Community Hospital may not be large enough to utilize all of the hospital's facilities at an efficient level. This makes such hospitals unattractive to investors and requires the financial support of a charitable or philanthrophic institution, or direct ownership involvement by a government entity.

Only about half of the rural SCHs have JCAH accreditation, a figure slightly lower than that for other rural hospitals and much lower than for urban hospitals. However, urban SCHs are similar to their other urban counterparts in this regard, with almost all of them being certified.

Rural SCHs have almost no involvement with teaching activities, but again in this respect they are almost identical to other rural hospitals. Sole Community Hospitals in urban areas fall somewhere in between the two levels represented by other urban and rural hospitals with regard to teaching activities.

2.2 Market Area Characteristics

The differences in regional location and in ownership would lead us to expect some substantial differences in the market areas for the different types of hospitals. Data are not available on specific market areas for each

hospital, but data that are available at the county level can shed some light on these local market conditions. These data are presented in Table 2-2.

Whether one looks at the total population in the county or its density, one finds that rural SCHs face a much smaller market for health care services than do other rural hospitals. Furthermore, the pre-PPS Sole Community Hospitals are in even less densely populated areas than are the post-PPS SCHs, although the average population per county is about the same. There are no substantial differences among the types of rural hospitals in the characteristics of the local population, such as the proportion enrolled in Medicare Part A, per capita income, and the unemployment rate, that might affect the demand for services. Once again, urban SCHs fall in between other urban hospitals and rural ones.

Similarities are also found between rural SCHs and other rural hospitals when health care resources available in the county are compared. The number of physicians per person is somewhat higher in SCH counties while the number of hospitals and the number of hospital beds per person are nearly identical. Hospital beds per capita are actually the same in other urban and SCH counties. However, other urban counties contain more than twice as many physicians per person.

Once again, urban SCHs fall somewhere in between other urban hospitals and rural hospitals. Surprisingly, counties with urban SCHs have fewer beds per person than rural counties. This result may indicate a proximity to another urban county that contains a larger number of hospital beds to which residents travel for some hospital services.

County level data therefore appear to indicate that there is no gross disparity in access to basic health care resources for the counties containing rural SCHs, as compared to counties containing other rural hospitals. However, some counties cover many square miles, and it may be the case that many residents of the county are quite far from a Sole Community Hospital. Furthermore, an SCH may provide services to residents of other counties that have no hospitals at all.

2.3 Capacity and Financial Characteristics

The preceding sections have shown the general similarity between rural SCHs and other rural hospitals in their ownership and local market

TABLE 2-2

CHARACTERISTICS OF COUNTIES IN WHICH SCHs ARE LOCATED, 1981[a]

	Sole Community Hospitals				Other Rural Hospitals	Other Urban Hospitals
	Urban	Pre-PPS Rural	Post-PPS Rural	All Rural		
Population Characteristics						
Total population (thousands)	603	24	23	24	32	1,037
Population density (per square mile)	183	17	24	20	49	2,217
Per capita income ($)	8,369	7,173	7,030	7,136	6,856	9,162
Unemployment rate	7.7%	7.6%	7.5%	7.6%	7.8%	7.6%
Percent of population in Medicare Part A	11.7%	13.3%	15.5%	13.9%	15.5%	12.0%
Health Care Resources						
Number of hospitals per county	11.2	1.7	1.4	1.6	1.8	15.7
Number of hospital beds per thousand population	3.3	4.1	4.7	4.3	4.5	4.3
Number of patient care physicians per 100,000 population	145	80	80	80	70	183
Number of specialist physicians per 100,000 population	120	58	51	56	45	163

[a] Calculations exclude Alaska and Hawaii.

Sources: American Hospital Association Annual Survey of Hospitals, Medicare Cost Reports, and Area Resource File.

characteristics, with the exceptions of population size and density. Table 2-3 further indicates that post-PPS Sole Community Hospitals are quite similar to other rural hospitals in terms of size and expenses. (The data presented in this and the following tables utilize samples that are slightly smaller than the number of hospitals listed in Table 2-1, due to inaccurate or missing data for a few hospitals.) However, hospitals with pre-PPS SCH designations are substantially smaller than other rural hospitals, with correspondingly lower admissions. The disparity between total days for the two groups is even greater than the difference for total beds, and is reflected in the lower average occupancy rate for pre-PPS than for post-PPS rural SCHs (47 versus 56 percent).

Total expenses average $4 million for the pre-PPS rural SCHs, only about 10 percent lower than the total expenses for other rural hospitals, in spite of the difference in their sizes. These differences will be explored further in the next section.

The differences between SCHs and other rural hospitals are only partially reflected in the average values of their financial characteristics. The degree of long-term indebtedness is slightly greater for rural SCHs. These hospitals, and those with pre-PPS designations in particular, have more negative "profit" margins on patient revenues, but higher margins on total revenues. The difference between patient revenues and total revenues is comprised of, among other items, donations, bequests, income from investments, cafeteria meals, drugs, etc. for nonpatients, and revenues from such services as parking lots, gift shops, and transfers from state and/or local governments. The results for these financial variables are different from those presented by Farley (1984), which are based on a much smaller number of observations for earlier years.

The differences between the margins on patient revenues and total revenues are 8.0 percentage points for rural SCHs, 5.1 points for other rural hospitals, and 4.0 points for urban hospitals. The larger differences for rural than for urban hospitals probably reflect the substantially greater government ownership of these hospitals, and the fact that some of them receive significant amounts of revenues in the form of transfers. The even greater gap for rural SCHs than for other rural hospitals probably reflects the higher cost structures of the SCHs, which require greater government or charitable support.

TABLE 2-3

SIZE, UTILIZATION, AND FINANCIAL CHARACTERISTICS OF SCHs, 1981

	Sole Community Hospitals				Other Rural Hospitals	Other Urban Hospitals
	Urban	Pre-PPS Rural	Post-PPS Rural	All Rural		
Total beds	110	51	72	57	70	255
Total admissions	4,414	2,019	2,866	2,233	2,636	9,588
Medicare admissions	1,272	599	987	701	926	2,723
Total days	26,148	10,212	16,224	11,801	15,775	71,462
Occupancy rate	55%	47%	53%	49%	56%	72%
Total expenses ($ thousands)	8,616	4,033	4,987	4,290	4,475	28,261
Financial Data[a]						
Long term debt as % of total assets	b	27%	30%	28%	26%	32%
Current ratio, general fund	b	361	261	332	321	218
Margin on patient revenue	b	-5.7	-4.5	-5.5	-3.4	-1.7
Margin on total revenue	b	2.5	2.8	2.5	1.7	2.3

[a] Financial data are available only for a sample of hospitals. For pre-PPS rural SCHs, post-PPS rural SCHs, other rural hospitals, and other urban hospitals, the samples are 48, 20, 555, and 799 hospitals respectively.

[b] Less than 10 observations.

Sources: American Hospital Association Annual Survey of Hospitals, Medicare Cost Reports, and Area Resource File.

A clearer picture of some of these effects can be gained by looking at the distributional aspects of these financial characteristics as presented in Table 2-4. It is interesting to note that the debt ratios for the higher percentiles are similar among the three categories. However, at the lower percentiles there are substantial differences. Twenty-five percent of urban hospitals have debt ratios of 13.0 or less, but for rural SCHs the figure for the 25th percentile is 4.5 percent. This disparity may result from situations where some government-owned SCHs obtain indirect financing through a government agency rather than borrowing directly to fulfill their needs for capital.

Table 2-4 also indicates the degree to which some SCHs rely on non-patient revenues to remain solvent. Twenty-five percent of rural SCHs had a negative margin on patient revenues in excess of 9.2 percent. However, substantial assistance must have been provided to these hospitals in the form of other types of payments such as transfers from governments, because the 25th percentile figure for the margin on total revenues falls dramatically to -0.7 percent.

2.4 SCH Utilization and Average Cost

The total expenses of rural Sole Community Hospitals appear to be high for hospitals of their average size and level of admissions. Table 2-5 indicates that the average cost per admission for a rural SCH is $1,733, almost $250 higher than the figure for other rural hospitals. Because the length of stay for rural SCHs is shorter (5.0 versus 5.8 days), this means that rural SCHs are even more expensive per day. Indeed, the cost per day for these hospitals is almost 40 percent higher that for other rural hospitals ($351 versus $256). This high cost per day for rural SCHs can be further highlighted by comparing it to other urban hospitals, which exhibit an identical cost in spite of higher casemix (CMI) levels. Rural SCHs with pre-PPS designations have even higher costs per admission and per day and lower lengths of stay than do rural SCHs in general.

One important reason for these high costs appears to be low occupancy rates for rural SCHs. However, occupancy rate differences would appear to be only part of the story. The cost per day for a rural SCH is 37 percent higher than for other rural hospitals, even though their CMIs are almost identical

TABLE 2-4

VARIATION IN FINANCIAL CHARACTERISTICS OF SCHs[a]

	Sole Community Hospitals	Other Rural Hospitals	Other Urban Hospitals
	Rural		
Long Term Debt As Percent of Assets			
Mean	27.6	26.3	32.2
90 Percentile	61.3	63.3	63.6
75 Percentile	47.9	41.0	46.5
25 Percentile	4.5	5.7	13.0
10 Percentile	0.4	1.5	3.6
Margin on Patient Revenue			
Mean	-5.5	-3.4	-1.7
90 Percentile	4.9	4.9	4.8
75 Percentile	0.5	1.3	1.7
25 Percentile	-9.2	-6.9	-4.4
10 Percentile	-16.5	-13.7	-8.9
Margin on Total Revenue			
Mean	2.5	1.7	2.3
90 Percentile	12.8	8.5	7.9
75 Percentile	5.8	5.4	4.9
25 Percentile	-0.7	-1.4	0.0
10 Percentile	-5.1	-5.9	-2.9

[a] Due to sample sizes of fewer than 5 hospitals, urban SCHs are omitted.

Sources: American Hospital Association Annual Survey of Hospitals, Medicare Cost Reports, and Area Resource File.

TABLE 2-5

AVERAGE UTILIZATION AND COST DATA FOR ALL PATIENTS AND MEDICARE PATIENTS, 1981

	Sole Community Hospitals				Other Rural Hospitals	Other Urban Hospitals
	Urban	Pre-PPS Rural	Post-PPS Rural	All Rural		
All Patients						
Cost per admission ($)	2,317	1,763	1,627	1,733	1,490	2,536
Cost per day ($)	488	366	305	351	256	351
Length of Stay (days)	5.2	4.8	5.3	5.0	5.8	7.2
Occupancy rate (%)	55	47	53	49	56	72
Casemix index	1.01	0.96	0.96	0.96	0.95	1.04
Cost per bed ($)	87,324	65,132	61,044	63,630	53,262	93,575
Cost per occupied bed ($)	178,173	133,716	111,290	128,080	93,620	127,966
Medicare Patients						
Admissions (as percent of all patients) (%)	31	31	36	33	39	31
Cost per admission ($)	2,337	1,892	1,677	1,842	1,547	2,823
Cost per day ($)	326	269	220	257	191	279
Length of stay (days)	7.4	7.2	7.6	7.3	8.1	10.2

Sources: American Hospital Association Annual Survey of Hospitals, Medicare Cost Reports, and Area Resource File.

and the occupancy rate is only 12 percent lower for rural SCHs. Possibly other resources, such as ancillary services, are present in rural SCHs which are grossly underutilized.

Cost per day is highest for urban SCHs. These hospitals combine the higher CMI of an urban hospital with the low length of stay and occupancy rate of a rural hospital, producing a cost per day of $488.

Another way to examine these cost differences is to compare the cost of a bed (per year) with the cost of an occupied bed. This comparison indicates the average annual cost of maintaining each bed and the concomitant services provided by the facility, versus the average cost of maintaining each occupied bed (holding constant the capacity to provide other services). Cost per bed ranges from $53,262 to $93,575 in other rural and other urban hospitals, with SCHs falling between these two extremes. The picture is dramatically different for cost per occupied bed. Here urban SCHs are most expensive at $178,000 and all rural SCHs are next at $128,000, slightly more than other urban hospitals.

Table 2-5 also presents similar cost and utilization data for Medicare patients. Medicare admissions comprise about a third of all admissions (the percentage for other rural hospitals is slightly higher). The length of stay is much longer for Medicare patients than for other patients, and the increase is proportionally the same for all hospital categories. However, the cost per day is much lower. As a result of these offsetting forces, the average cost per Medicare admission is only slightly higher than the average for all admissions in each category, ranging from $1,547 for other rural hospitals to $2,823 for other urban hospitals.

The data presented above is based on comparisons of averages for SCHs and their non-SCH counterparts. However, as one might expect, there is much variation about these mean cost levels. Indeed, Table 2-6 indicates that the variation in average costs, occupancy rate, and casemix index is at least as great for rural SCHs as for other rural hospitals. As a result, although SCHs are more expensive on average than non-SCH hospitals, some SCHs are less costly than the average non-SCH.

For example, the average cost of a Medicare admission for a rural SCH is $1,842, 19 percent more than for other rural hospitals. But Table 2-6 shows that over 25 percent of rural SCHs have an average cost below that for other

TABLE 2-6

VARIATION IN AVERAGE COSTS OF SCHs

	Sole Community Hospitals		Other Rural Hospitals	Other Urban Hospitals
	Urban	Rural		
Cost Per Admission				
Mean	2,317	1,733	1,490	2,536
90 Percentile	3,393	2,441	2,060	3,779
75 Percentile	2,715	1,990	1,727	2,935
25 Percentile	1,800	1,356	1,201	1,889
10 Percentile	1,524	1,086	1,008	1,543
Cost Per Medicare Admission				
Mean	2,337	1,842	1,547	2,823
90 Percentile	3,582	2,658	2,171	4,157
75 Percentile	2,953	2,148	1,822	3,343
25 Percentile	1,747	1,398	1,201	2,107
10 Percentile	1,540	1,142	997	1,659
Occupancy Rates				
Mean	55	49	56	72
90 Percentile	81	72	78	88
75 Percentile	71	62	69	83
25 Percentile	40	35	45	64
10 Percentile	28	26	35	50
CMI				
Mean	1.01	.96	.95	1.04
90 Percentile	1.09	1.06	1.03	1.16
75 Percentile	1.06	1.01	.99	1.10
25 Percentile	.96	.91	.91	.99
10 Percentile	.92	.87	.87	.93

Sources: American Hospital Association Annual Survey of Hospitals, Medicare Cost Reports, and Area Resource File.

rural hospitals. As a result, some SCHs may find it to their advantage to be paid on the basis of the "grouped" federal rate under PPS, rather than be paid largely on the basis of their own historical costs, as would be the case with an SCH designation. This possibility will be further explored in Chapter 5. In addition, 25 percent of all rural SCHs have occupancy rates above 62 percent and Medicare casemix indexes above 1.01 (some of which represent newly designated Rural Referral Centers).

2.5 The Scope of Services Provided

It is apparent from the analysis in the preceding section that one cause of the high costs of SCHs might be the existence in these hospitals of ancillary services that are not as highly utilized as in other hospitals. Data were not available to measure the intensity of utilization of services among hospitals in our sample. However, we can present data on whether or not particular services are available and, to some degree, on the costs of providing some of these services. These data are presented in Table 2-7.

The first part of Table 2-7 presents data on the percent of total hospital expenditures allocated to a number of specific ancillary services, as well as to ancillary services as a whole. These percentages are remarkably stable across all hospital categories. Ancillaries account for about a third of all expenditures, with the operating room and the lab being the two largest identifiable components at about 7 percent each. However, it should be borne in mind that these figures do not indicate the percent of costs in each category that are fixed and unrelated to utilization.

Table 2-7 also indicates the proportion of hospitals in each category that provide some more specific services. The table does not present data for services that are provided by almost no hospitals in any category, such as a burn care unit, cobalt therapy, or an organ bank.

The vast majority of rural SCHs provide an emergency department, physical therapy, a post-op recovery room, and respiratory therapy. Approximately half of them have electroencephalography services, a mixed intensive care unit, and a social work department. The other services are provided by only a minority of rural SCHs. Generally speaking, rural SCHs are similar to other rural hospitals, but tend to provide most services with slightly lower frequency. However, a greater number of SCHs provide psychiatric EMS, respiratory

TABLE 2-7

SCOPE OF SCH SERVICES, 1981

	Sole Community Hospitals				Other Rural Hospitals	Other Urban Hospitals
	Urban	Pre-PPS Rural	Post-PPS Rural	All Rural		
Percent of Total Expenditures Allocated to:						
Operating room[a]	7	7	7	7	6	8
Delivery room	1	1	1	1	1	1
Radiology[b]	3	3	4	3	4	4
Lab	7	7	8	7	8	7
Physical therapy	1	1	1	1	1	1
All ancillary services	32	31	34	32	33	35
Percent of Hospitals with the Following Services:						
Bloodbank	54	57	67	60	65	80
Diagnostic radioisotope facility	43	35	43	37	43	82
Electroencephalography	50	36	51	40	43	83
Emergency department	96	89	95	91	91	91
Family planning	4	3	2	3	3	14
Hemodialysis-inpatient	21	2	6	3	3	40
Histopathology lab	61	33	35	33	37	83
Mixed intensive care	68	52	62	55	55	80
Open heart surgery	4	0	1	0	0	19
Outpatient department	39	28	23	27	26	53
Physical therapy	89	76	73	75	78	94
Post-op recovery room	96	79	77	79	86	97
Premature nursery	32	14	14	14	19	41
Psychiatric EMS	26	21	21	21	13	39
Radium therapy	11	2	1	2	4	28
Rehab outpatient	14	14	13	14	15	44
Respiratory therapy	93	74	83	76	85	96
Social work department	75	50	55	51	61	92
Therapeutic radioisotope facility	14	5	6	5	7	40
X-ray therapy	11	4	8	5	8	31

[a] Includes costs allocated to operating room, recovery room, and anesthesiology.

[b] Includes costs allocated to diagnostic radiology, therapeutic radiology, and radioisotope facilities.

Sources: American Hospital Association Annual Survey of Hospitals, Medicare Cost Reports, and Area Resource File.

therapy, and a social work department, than their rural counterparts. Urban SCHs fall in between rural hospitals and other urban hospitals.

Rural SCHs that received their designations prior to PPS are less likely to provide most of the listed services than are SCHs designated under PPS. In particular, a substantially lower percentage of pre-PPS rural SCHs provide a bloodbank, diagnostic radioisotope facilities, electroencephalography, mixed intensive care, or respiratory therapy.

These results indicate that the average rural SCH provides a fairly diverse range of services, one that is similar to the range provided by other rural hospitals that are larger on average. This conclusion is supported by evidence presented by Farley (1984) that SCHs are more likely to possess more specialized hospital units, such as acute pediatric units, obstetrics units, and intensive care units, than are hospitals of similar size and location. The high costs of SCHs most likely result in part from underutilization of these services.

3.0 CRITIQUE OF SOLE COMMUNITY HOSPITAL MARKET AREAS

3.1 Service Areas Used in Defining Sole Community Hospitals

Hospitals that have already received an SCH exemption prior to the effective date of PPS are "grandfathered" into this designation. However, hospitals that have not received prior approval must be located in a rural area and meet one of the following conditions in order to be classified as an SCH:

1) The hospital is located more than 50 miles from other like hospitals;

2) The hospital is located between 25 and 50 miles from other hospitals and meets one of the following criteria:

    a) No more than 25 percent of the residents or (if data on general resident utilization are not available) no more than 25 percent of the Medicare beneficiaries in the hospital's service area are admitted to other like hospials for care;

    b) The hospital has fewer than 50 beds and the PRO or intermediary certifies that the hospital would have met the above criterion (2a) were it not for the fact that some beneficiaries or residents were forced to seek care outside of the service areas because specialty services were unavailable at the community hospital;

    c) Because of local topography or periods of prolonged severe weather, the other like hospitals are inaccessible for at least one month out of each year;

3) The hospital is located between 15 and 25 miles from other like hospitals and because of local topography or periods of prolonged severe weather conditions, the other like hospitals are inaccessible for at least one month out of each year.

In meeting these criteria only short-term acute care hospitals are to be considered. Distances are measured along improved roads. A hospital is not allowed to obtain SCH status solely on the basis of a specific set of services provided, but in calculating a hospital's coverage of its service area, hospitals with less than 50 beds are allowed to exclude trips made by residents to other hospitals to obtain more specialized service not available in the hospital. A hospital's service area is defined as the area from which it draws at least 75 percent of its admissions. The determination generally is based on the total patient population, however, if that information is not available, the Medicare population can be used in the calculations.

A hospital that is more than 50 miles away from the nearest hospital would appear to have a fairly clear justification to be designated a Sole Community Hospital. Consequently, the analysis in this chapter will focus on the appropriateness of the remaining criteria. The question of the appropriateness of these criteria is analogous to asking the question, "What is the definition of a local market area for hospital services?" Unfortunately, there is no clear answer to such a question, and the difficulties that surround the definition of a market pervade all areas of economic activity.

3.2 General Problems in Defining A Market Area

No product or service is completely unique. For example, the market for single-family dwellings is a distinct one, but one that is not completely separate from the market for apartments. If the prices of these alternative dwellings and their locations change, some consumers may switch from one to the other.

Products and services that are distinguished in part by their geographical location, such as radio broadcasts, newspapers, most retail stores, and hospitals, pose particular problems. In the case of radio broadcasts, for example, one location may be able to receive signals from stations A and B, but not from station C, indicating that the first two stations to some degree are substitutes in the same market, but that station C is not. However, another location may be able to receive signals only from stations B and C, indicating that these two stations are in the same market. It would be quite possible to construct a "chain of substitutes" that would lead to the implausible and incorrect conclusion that there was only one national market for radio broadcasts.

The definition of the appropriate market has frequently been the pivotal determinant of the success or failure of antitrust cases brought against companies by the U.S. government. For example, in the case the *United States v. Philadelphia National Bank*, 374 U.S. 321 (1963), the government sought to prevent the consolidation of two banks in the Philadelphia area. The U.S. District Court ruled that the merger was not illegal, in part because it considered the relevant market to be commercial banking in the entire northeastern region of the U.S. However, the Supreme Court held that the appropriate market definition was commercial banking in Philadelphia and its three contiguous counties, and that the merger would violate antitrust law.

Given the importance of market definition to such legal proceedings, some effort has been devoted to the methodology of defining a market. (See Bishop (1952), Massel (1962, Chapter 8), Olson and McFarland (1962).) However, no methodology is without major problems, and a decision on the scope of a market will ultimately include distinctions that are subjective. A number of approaches have been used, such as analyzing the characteristics of the services, the uses to which the services are put, the relative prices of the services, the way in which the services are produced, potential providers, and recent changes in the market. To delineate geographic markets, analysts have primarily relied on gathering data on service delivery patterns, and on consumer surveys.

Another measure, the cross elasticity of demand, incorporates many of these considerations into one number, and is often advocated by economists. The cross elasticity of demand indicates the degree to which consumers will increase their purchases from one provider in response to price changes by another provider, and in so doing this measure incorporates consideration of the degree to which the services are considered substitutable by consumers. Although the cross elasticity of demand sounds appealing, it has rarely been used because the data needed to estimate it have not been available. This problem is particularly severe in the case of hospital services, where there is very little shopping and decision-making on the basis of price.

3.3 The Relationship Between Hospital Use and Distance

There are a number of studies, particularly of urban areas, that document the effects of distance from a hospital (as measured in either miles or time) on the probability of patients seeking care at that hospital. For example, Drosness and Lubin (1966) analyzed admissions data for 10 hospitals in Santa Clara county in California. They found that for almost all of the hospitals, over 75 percent of their admissions came from within 15 minutes travel time.

However, this and other studies have made it equally clear that distance from the hospital is not the sole determinant of which hospital is chosen by the patient. For example, in a study of live births at 16 hospitals in Baltimore in 1969, Studnicki (1975) found that 20 percent of his sample of patients travelled to those four hospitals of the 16 alternatives that were

farthest from their residence. A number of other factors can affect the choice of a hospital, such as distance from place of work, occupancy rates, the provision of particular services, perceptions of quality, and how these factors compare to the distance to and characteristics of alternative hospitals.

The physician can also play a substantial role. In many situations the patient first chooses a physician who may have admitting privileges at one or more hospitals, the location of which may be in part determined by distance from his/her office or place of residence. The choice of hospital then becomes a joint decision between patient and physician.

McGuirk and Porell (1984) incorporate considerations of alternative hospitals and the locations of physicians into a model that is then estimated using data for 184 resident communities and 29 hospitals in Allegheny County, Pennsylvania in 1975. They find that as the location of a hospital gets further away from a small community, as measured by either travel time or distance, the percentage of patients from the community using the hospital drops sharply. (In other words, the elasticity of "market share" of a hospital with respect to either time or miles from the community is substantially greater than one.) Furthermore, there were differences in the degree of responsiveness across different types of service, such as medical-surgical, obstetrics-gynecology, pediatrics, and psychiatry, with psychiatric services usually having the lowest elasticities.

In his overview of measures of hospital performance, Griffith (1978) presents some evidence specifically related to rural areas:

> The evidence indicates that some patients travel farther than 30 miles for hospital care. Fifteen to 25% of patients leave rural communities with limited service hospitals [in order to obtain care] (page 16).

3.4 The Definition of a Hospital Market Area

Many of the early hospital planning studies designated independent geographical service areas (see Studnicki (1975), p. 681 for citations) out of which there is little travel to obtain hospital services. These efforts are similar to constructing a chain of substitutes, as described in Section 3.2. More recently, Luft and Maerki (September 1984) formed clusters composed of

hospitals that had at least four neighboring hospitals within five miles. (If in turn a neighbor had at least four hospitals within five miles, then these were also included in the cluster, and this search was continued until no more hospitals could be included.) Luft and Maerki found 113 clusters containing 1,860 hospitals. The clusters ranged in size from Los Angeles with 205 hospitals, to such locations as Newington, Connecticut and San Angelo, Texas with 5 hospitals each.

These efforts are of use in considering the potential effects of competition, and for regional planning of the location of health care facilities, but the areas designated are in no way the same as market areas for individual hospitals. For example, it is unlikely that a person residing at one end of the Los Angeles cluster would consider traveling to the opposite end of the metropolitan area in order to obtain hospital care.

Griffith (1978) states that "specific definition of hospital service communities has come more slowly than the clarity of the concept would indicate" (p. 16). But the discussions presented here indicate that any attempt to delimit a market, or service area, for an individual hospital must necessarily involve some arbitrary decisions. It is therefore not surprising that there is little precision in the implementation of such a concept.

The results presented in the preceding section provide information about the effect of distance on the utilization of hospitals, but they provide little guidance for the definition of a hospital's market area. Griffith's statement about 15 to 25% of patients leaving rural communities with limited service hospitals in order to obtain care appears to be the empirical finding closest to the criteria for Sole Community Hospitals.

The influence of the physician over the choice of hospital is one justification for allowing a Sole Community Hospital designation even when up to 25 percent of the patients in the hospital's service area use other hospitals. Even though some patients might be willing to use another hospital, the physician might not be willing to split up his cases among several hospitals, and travel over 25 miles more each day just to do his hospital rounds. If the SCH were to close, then in the long run the physician might even choose to relocate his office, further isolating a segment of the community from health care.

Even if attempts to obtain an objective definition of a Sole Community Hospital are destined to fail, one can compare the PPS criteria with others

that have been used in order to determine whether there is some continuity or whether the current criteria represent a radical departure that requires careful scrutiny. The requirement that no more than 25 percent of the residents in the hospital's service area are admitted to other hospitals for care apparently has no precedent, but input from regional administrators who had dealt with SCH designations was incorporated in the choice of this criterion.

The National Guidelines for Health Planning that were issued in 1978 also contained provisions that addressed the special conditions of rural areas. In particular, a standard was issued for non-federal short-stay hospital beds that stated there should be no fewer than 4 such beds per 1,000 persons. However, the standard was relaxed for rural areas where a majority of residents would otherwise be more than 30 minutes travel time from a hospital. This standard cannot be made directly comparable to the SCH criteria. However, the general magnitude of this limit would appear to be broadly consistent with those used for SCH determination.

One question that is raised by the planning guideline exception, and by some of the studies cited previously, is whether the criteria for SCHs should be presented in terms of travel times or travel distances as measured in miles. Travel times would appear to be more relevant, in that they incorporate both the directness of the land route and the condition of the road. However, travel times may vary according to the mode of transportation, the behavior of the driver, and seasonal changes in the condition of the road. Measurement of travel times would therefore require administrative decisions that could be subject to appeal. Distances via improved roads can be determined more easily than travel times, and require less administrative input.

3.5 Criteria Based on Interrupted Access

The service area criteria for Sole Community Hospital designation contain two components that are based on the temporary inaccessibility of adjacent hospitals. Were it not for interrupted access, the presence of these other hospitals would preclude the potential SCH from obtaining such designation.

The current regulations require the period of inaccessibility to be at least one month long. Information has been developed since the regulations

were promulgated that indicates that this criterion is quite severe--in only a few locations in the country are the climate and topography such that accessibility to an adjacent hospital might be interrupted for an entire month. One may therefore want to examine whether it is advisable to use an inaccessibility criterion that is measured in days or weeks. Unfortunately, there are no data available that would indicate how many hospitals might be affected by such a change in this criterion.

In general, the use of an interrupted service criterion involves a societal decision that rests on judgements that are difficult to quantify. Even under the current regulations, an adjacent hospital is accessible most of the time and therefore provides an alternative to the hospital applying for SCH designation for most of the year. Furthermore, for some conditions a longer travel distance, or even the postponement of hospitalization for a period due to inaccessibility, may not produce substantially increased risk. A clinical panel could analyze the mix of cases treated in a hospital and estimate the percentage of cases that would suffer from the lack of access to a reasonably close hospital for a given period, such as four days or two weeks, for example. However, it would still remain for society to decide whether it is worthwhile subsidizing an SCH hospital for the small period of time when the alternative to the SCH is inaccessible.

3.6 Concluding Remarks

With all of the analysis that has been performed on the effects of distance on hospital choice, the definition of a market area remains elusive. But the designation of a Sole Community Hospital implies that there is a reasonable market area that is almost exclusively served by the SCH. As a result, the market criteria for defining a Sole Community Hospital will necessarily involve some arbitrary decisions.

It may be the case that policy-makers have in mind some subjective sense of the maximum distance that most persons should be required to travel in order to receive care, some of it for conditions that may require immediate treatment. Using such an approach, one might decide that persons who live in more isolated rural areas should not have to travel substantially further than residents of urban areas travel in order to receive their care, and that persons who live much further away deserve protection of their facilities. It

appears that most persons in urban areas travel less than 30 minutes to their hospital. (That the travel time is not less than it is is due to congestion and the fact that some patients do not choose the nearest hospital.) A 30 minute travel interval in an urban area might reasonably translate into approximately a 25 mile interval in a rural area. The criteria for SCH designation would therefore appear to be broadly consistent with such an approach of comparing potential rural travel distances with actual urban behavior.

4.0 REIMBURSEMENT PROTECTION FOR UNEXPECTED VOLUME DECLINES

4.1 Regulatory Authority

Section 405.476 of the 1983 Title 42 Code of Federal Regulations (redesignated as Title 42 Code of Federal Regulations Section 412.92, Volume 50 Federal Register, March 29, 1985) outlines the criteria and procedures to be followed in making additional payments to SCHs experiencing significant volume declines. Paraphrasing,

(1) For reporting periods beginning between October 1, 1983 and October 1, 1986, the transition period, HCFA will provide for a payment adjustment in any cost reporting period during which the hospital experiences more than a 5% decrease in its total discharges of inpatients in its immediately preceding reporting period.

To qualify, an SCH must

(2) Submit documentation demonstrating the size of the decrease;

(3) Show the effect of the decline on per discharge costs; and

(4) Further show that the decrease is due to extraordinary circumstances beyond the hospital's control, including externally imposed occurrences such as (but not limited to) strikes, fires, floods, earthquakes, inability to recruit essential physician staff, or unusually prolonged severe weather conditions with substantial cost effects.

For qualifying hospitals, HCFA

(5) will determine a per discharge adjustment amount including at least an amount reflecting the reasonable cost of maintaining the hospital's necessary core staff and services, based on

   (a) the individual hospital's needs and circumstances, including minimum staffing requirements imposed by State agencies,

   (b) the hospital's fixed (and semifixed) costs, other than those costs reimbursed on a reasonable cost basis, and

   (c) the length of time the hospital has experienced a decrease in utilization.

These criteria and cost-finding methods follow directly from the 1974 Social Security regulations pertaining to the Section 223 routine cost penalties, except for the 5% rule. In other words, HCFA has made case-by-case

adjustments for untoward volume declines for ten years, making determinations of "extraordinary circumstances," "essential staff," "fixed and semifixed costs," and "the reasonable cost of maintaining the hospital's necessary staff and services."

While the new legislation appears silent on how much of the uncovered fixed costs Medicare is responsible for, previous allowances have only included Medicare's share. Moreover, given the statutory language against sharing non-Medicare costs, it seems clear that HCFA's responsibility is only for its share of fixed costs and not the whole amount. The 5% threshold, on the other hand, is triggered by total discharges, not just Medicare declines.

4.2 General Arguments For Volume Protection

4.2.1 Daily, Monthly, and Annual Variation

Practically all hospitals experience variations in their Average Daily Census across the week, the month, and the year. Average occupancy rates are generally the highest on Monday-Thursday of the typical week (over 90%), falling somewhat on Friday (about 80%), then dropping below 70% on the weekend (Joskow, 1980). Winter months, January-March, are usually the busiest, with notable drops in July and September. December is by far the least active month due to the holidays. Finally, over the last 30 years, short-term general admissions have grown steadily from about 17,000,000 in 1950 to over 36,000,000 in 1982 (AHA, 1983). Occupancy rates over this same period have been more cyclical, rising from 74% in 1950 to a peak of 78% in 1970, falling steadily to 73.5% in 1978, rising again to 76% by 1981 before starting to fall in 1982. Of the three time periods, utilization is most variable across months (Phillip and Dombrosk, 1979).

Sources of volume variation include a number of underlying epidemiological characteristics of the population, locational factors, and socio-medical styles of hospital use. The shorter the time period, the greater the role played by random episodes of illness in the population, e.g., flu, natural disasters. Longer term volume changes are more likely influenced by: (1) the spread of health insurance; (2) new technologies that make hospitalization a more effective mode of care, e.g., laser surgery, cancer therapy; and (3) secular trends in population growth and demographic mix. On a weekly or monthly basis, these factors are relatively fixed, and hence play little role in volume fluctuations over these time periods.

4.2.2 Stand-by Capacity

Each hospital must judge how much stand-by capacity (or reservation quality to use Joskow's (1980) term) it needs to assure that no patient will be turned away or that the likelihood is below some threshold (e.g., 2%). Queuing theory has been applied to the problem, showing that the optimal occupancy rate varies directly with hospital size (Shonick, 1972; Joskow, 1980; Phillip, et al., 1984). Phillip, et al. (1984, Table 2), for example, estimate that a 50 bed hospital could only run a 78% occupancy rate to be 95% confident that it could admit a patient instantly vs. a 93% occupancy rate for a 500 bed hospital. This is before considering the imperfect substitutability of medical-surgical, ICU, obstetric, pediatric, psychiatric, and other kinds of beds which further reduces optimal occupancy rates. Needed stand-by capacity also naturally varies by the underlying variability of demand which, Phillip, et al. (1984, p. 56) argue, is greater in land-locked regions due to more severe climatic variation. It will also vary inversely with the hospital's population base. This makes the hospitals in more sparsely populated rural areas especially vulnerable. The same inverse relationship is observed, by the way, if more hospitals are serving a given population. The policy implications are quite different, however, where another hospital exists to accept transfers (implying interdependence).

Summarizing so far, queuing theory, with modification, can be used to rationalize observed differences in occupancy rates -- at least to a first approximation.* Urban-rural, regional, and bedsize differences in average occupancy rates reflect the extent to which hospitals have already protected themselves against large, random changes in utilization. As almost all of this variation is on a weekly or monthly basis, hospitals presumably protect themselves primarily against short-run, epidemiological and seasonal instability. The lower occupancy rates and higher average costs of rural hospitals as a group would reflect this kind of community-wide protection, and would provide a partial justification for separate DRG rates across urban-rural areas (and possibly regions).

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*Both McClure (1976) and Joskow (1980) argue that a large number of "unjustified" beds still remain in the system even accounting for legitimate inequalities in occupancy rates.

Annual utilization variation is a different matter because: (a) generally, it is far less important in influencing needed stand-by capacity, and (b) its sources are usually less random in nature, and consequently more predictable. Assuming hospitals add beds and staff to achieve some equilibrium stand-by level in any year, unexpected annual declines in utilization produce truly excess capacity and higher average fixed costs. It is a legitimate question whether secular declines due to population trends are unanticipated. They probably are predictable but do not change the hospital's stand-by capacity requirements in the short run. At issue is how easily it can convert beds to other uses. Finally, it goes without saying that declining utilization due to changing demographics is a problem in not only rural but inner city areas as well.

It is in society's best interest for all sectors of the economy to be responsive to secular change; rigidity has its costs in underutilized capacity in one place and shortages elsewhere. Reducing capacity is economically painful, nevertheless, and should be done judiciously. Short-term medical-surgical beds cannot be converted overnight into utilized long-term beds. Protection against precipitous occupancy declines can help spread the burden among hospitals for demographic change and insure a smooth restructuring of the nation's bed supply.

4.3 Volume Protection for SCHs Alone

While it is recognized that nearly all U.S. hospitals experience both daily, monthly, and annual variation in utilization, only Sole Community Hospitals have been singled out for volume protection during the transitional phase of PPS. Why this is so hinges on the fixed payment rates and the lack of viable medical alternatives for SCH patients in the case of hospital closure.

Before the 1972 Social Security amendments that authorized routine cost limits, Medicare was a completely retrospective cost-based system. Any volume declines would result in equal, offsetting increases in average Medicare per diems, leaving the hospital financially protected--at least for its Medicare patients. When the routine cost limits were applied, equal, offsetting adjustments to per diems were no longer guaranteed if volume declines produced unreasonably high average routine costs. This was of

particular concern for beneficiaries served by Sole Community Hospitals because they had no viable alternative if the hospital (a) decided to charge them for any penalties, (b) stopped admitting Medicare patients, or (c) went bankrupt.

The same concerns remain under PPS.* Large volume declines still put the Medicare beneficiary at risk by undermining the financial solvency of the SCH. A similar beneficiary risk is presumed not to exist in other, competitive, rural or urban hospitals. Closures and mergers may cause hardships, to be sure, but should not seriously jeopardize reasonable access to acute care.

4.4 Policy Issues and Overview

Under the new legislation, SCHs are to receive additional reimbursements to cover their fixed and semifixed costs due to uncontrollable volume declines greater than 5%. This protection is extended only during the transitional phase. Commenters on the regulations raised several excellent points, most of which HCFA has already responded to by clarifying SCH designation criteria. A few technical issues remain, however, that concern the volume shelter.

First, how reasonable is the 5% threshold that triggers the volume adjustment? Presumably, a threshold was deemed necessary to avoid cost-finding and adjudication of a large number of hospital requests. Thus, it is of some interest to know how many SCHs, as well as other hospitals, experience annual volume declines in excess of 5%. This knowledge would provide HCFA with an estimate of the number of requests it can expect over the transition period. It is also of interest to know how variable a hospital's costs are when volume declines are within the 5% threshold.

Second, over what period should the volume declines be calculated. The law explicitly defines it as "the hospital's reporting period," which is

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*Congress did remove the hospital's right to bill patients for any uncovered costs due to excesses above the established PPS rate.

almost always its fiscal year. We have briefly discussed the sources of within-year variation, but a fuller exposition of the choice of period seems warranted.

Third, some commenters were concerned that the retrospective cost-finding mandated in the regulations robbed the system of at least part of its prospectivity, leaving hospitals unsure of their actual rate. Couldn't a more formulistic method be used that would automatically adjust the current period's rate rather than by auditing fixed and variable costs and making settlements a year or more after the decline?

The rest of the chapter is organized as follows. In the next section we present numerous statistics on the level and variation in hospital utilization and occupancy rates for SCHs compared with other rural and urban hospitals. This is followed by a section on cost variation with rough estimates of the expected annual outlays per hospital and systemwide costs associated with SCH volume protection. Next, we consider the feasibility of putting the whole process on a formula basis. This includes a review of the econometric literature on hospital cost functions and the methods currently being used in state rate-setting programs.

4.5 Levels and Variations in Utilization and Costs of SCHs

This section provides empirical data on the variation in volume and costs among SCHs. We first describe how the SCH market area changed over the 1977-81 period relative to other rural and urban hospitals. This is followed by similar comparative trends in SCH utilization and costs. After describing gross trends using averages, the subsequent sections show how much occupancy and utilization variation exists within SCHs and how they differ from other rural and urban hospitals.

4.5.1 Trends in SCH Market Areas

Table 4-1 gives five year trends for a few of the more relevant market area characteristics of SCHs. While one might have expected deterioration in their areas, with declining populations and fewer physicians, this does not appear to be the case. The average SCH county population grew slightly between 1977-81 while it declined for other rural hospitals. Per capita income growth also more than kept pace with other areas. Physician supply also grew more rapidly than elsewhere, which is consistent with the recent locational patterns favoring rural areas.

4.5.2 Trends in SCH Utilization and Costs

Table 4-2 presents 1977-81 trends in hospital utilization and average costs for SCHs vs. other rural and urban hospitals. Volume growth in SCHs as a group has been positive:

- total admissions and days per rural SCH grew at an average .9% and 1.1% annually from 1977-81; and
- Medicare admissions grew at an average 5.8% annually.

This growth exceeds that in other rural hospitals but is somewhat less than that experienced in urban areas. Of course, rural SCHs remain quite small in total volume relative to all other groups.

Average rural SCH bedsize grew slightly as well, which is a little surprising given their very low occupancy rate of 48%. Their overall occupancy rate grew slightly versus a slight decline in other rural hospitals. Thus, from an aggregate perspective rural SCHs as a group appear to be doing somewhat better than other rural hospitals in terms of utilization trends albeit still suffering from chronic underutilization of beds.

Rural SCHs apparently have always had higher average costs than other rural hospitals, both per day and per discharge. Over the 1977-81 period, per diem inflation was quite similar among SCHs and other hospitals, while both were roughly a point higher than urban hospitals. SCH costs per admission also rose a percentage point faster than in urban areas and about one-half a point faster than in other rural hospitals.

TABLE 4-1

TRENDS IN SCH MARKET CHARACTERISTICS, 1977-81

	Sole Community Hospitals		Other Rural Hospitals (4)	Urban Hospitals (5)
	Urban (2)	Rural (3)		
County Population				
1977	624,170	22,633	34,700	1,107,496
1981	602,800	24,124	32,186	1,036,797
% Change	-.9%	1.6%	-1.9%	-1.6%
Population/Sq. Mile				
1977	192	18	50	2,425
1981	183	20	49	2,217
% Change	-1.2	2.6	-.5	-2.2
Per Capita Income				
1977	5,319	4,811	4,723	6,228
1981	8,369	7,136	6,856	9,162
% Change	11.3	9.9	9.3	9.7
Percent Medicare				
1977	9.9	12.0	13.4	10.3
1981	11.7	13.9	15.5	12.0
% Change	4.2	3.7	3.6	3.8
Nursing Home Beds/1,000 Population				
1977	5.5	7.4	9.8	6.0
1981	5.1	7.4	10.0	6.0
% Change	-1.9	0	.5	0
MDs/100,000 Population				
1977	130	70	65	200
1981	140	80	70	200
% Change	1.9	3.3	1.9	0

Source: Area Resource File.

TABLE 4-2

TRENDS IN UTILIZATION AND AVERAGE COSTS OF SCHs vs. OTHER RURAL AND URBAN HOSPITALS, 1977-81

	Sole Community Hospitals		Other Rural Hospitals	Urban Hospitals
	Urban (2)	Rural (3)	(4)	(5)
Total Admissions				
1977	3,900	2,143	2,663	9,088
1981	4,386	2,222	2,692	9,789
% Change	2.9%	.9%	.2%	1.9%
Medicare Admissions				
1977	981	556	812	2,215
1981	1,272	701	931	2,724
% Change	6.5%	5.8%	3.4%	5.2%
Total Days				
1977	23,489	11,293	16,404	66,899
1981	26,148	11,801	15,888	71,471
% Change	2.7%	1.1%	-.8%	1.7%
Length of Stay				
1977	5.16	5.12	6.07	7.23
1981	5.21	4.95	5.83	7.19
% Change	.2%	-.8%	-1.0%	-.1%
Total Beds				
1977	106	55	72	245
1981	110	57	70	255
% Change	.9%	.9%	-.7%	1.0%
Occupancy Rates				
1977	49.4	48.3	57.4	69.8
1981	54.5	48.6	56.4	72.0
% Change	2.5%	.2%	-.4%	.8%
Cost Per Day				
1977	321	202	148	210
1981	488	351	256	351
% Change	10.5%	13.8%	13.7%	12.8%
Cost Per Admission				
1977	1,457	1,009	883	1,519
1981	2,317	1,735	1,490	2,536
% Change	11.6%	13.5%	13.1%	12.8%

Source: AHA Survey tapes and Medicare Cost Reports.

4.5.3 Variations in SCH Occupancy Rates

While capacity utilization rates among SCHs did not deteriorate in the five years, 1977-81, the 49% average rate is certainly indicative of serious underutilization. If the average occupancy rate is this low, some hospitals must be even lower.

Figure 4-1 gives the 1981 frequency distribution of occupancy rates for rural SCHs vs. other rural and urban hospitals. It shows that one of every five SCHs have occupancy rates between 40 and 50% while over 1/3 have rates less than 40%. This is much higher underutilization than found in rural hospitals generally where fewer than 1-in-5 hospitals have occupancy rates below 40%. At the other extreme, only 12% of SCHs reported occupancy rates above 70% vs. 23% for other rural hospitals. Urban hospitals show a highly skewed distribution, with very few hospitals operating below 60% of capacity.

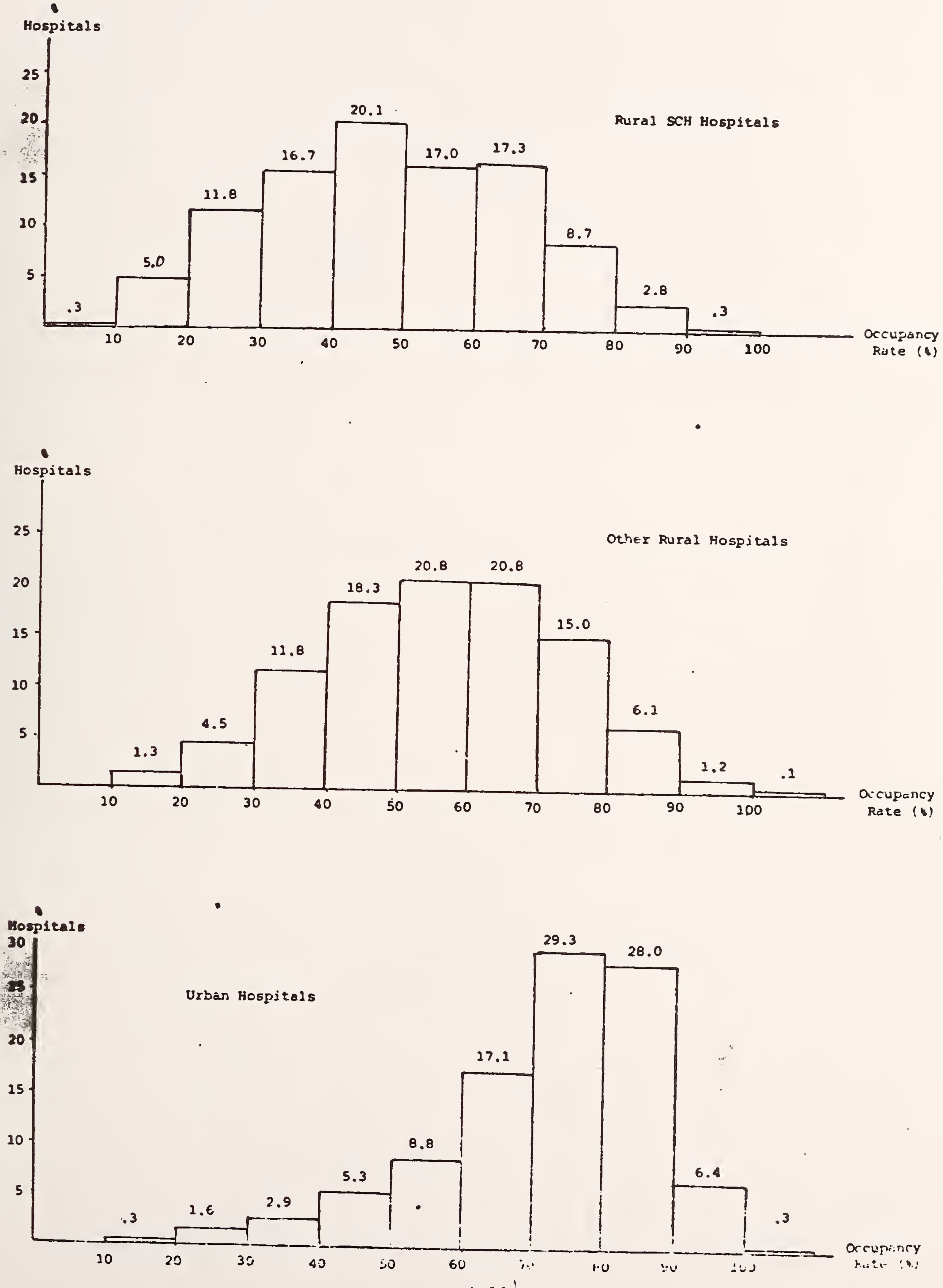
4.5.4 Annual Variations in SCH Admissions

That large numbers of SCHs are operating at such low capacity levels with higher per admission costs than other rural hospitals is cause for concern. Further utilization declines could affect the solvency of the institution. How variable are the utilization patterns among SCHs? Are they worse than among other rural and urban hospitals?

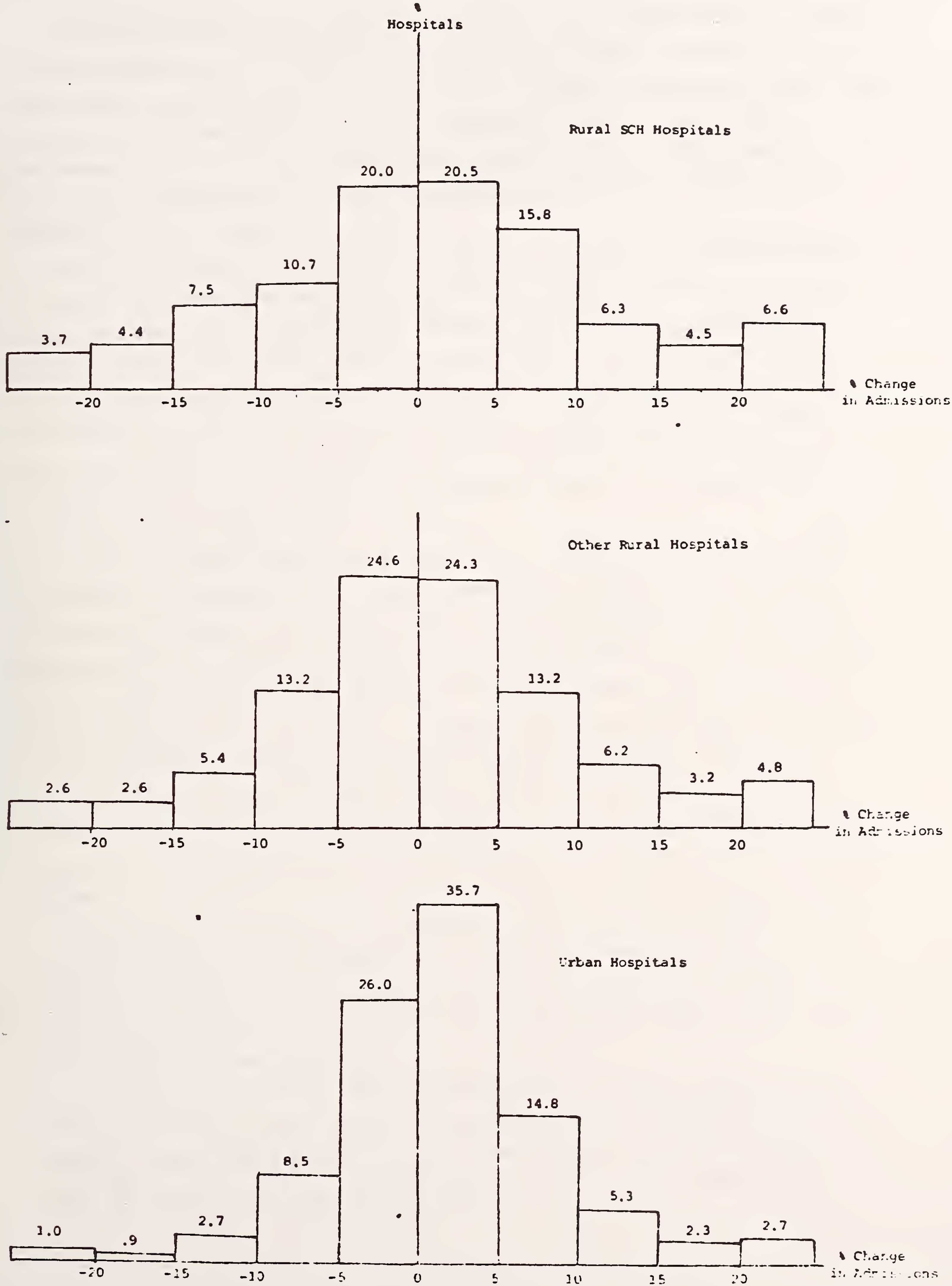
Figure 4-2 gives the frequency distribution of admissions changes, ranging from annual declines in excess of 20% to increases of 20% or more. Each group's distribution includes all annual changes over the 1977-81 period, or 4 observations per hospital times the average number of hospitals in each group. According to our data, about 4-in-10 admissions changes in rural SCHs were within plus or minus 5%, with 1-in-5 between zero and -5%. Approximately another one quarter reported admissions declines in excess of plus 5%, with 8% showing declines in excess of 15%.

It is also important to note that over one-third of the volume changes in rural SCHs were in excess of plus 5%; important because these may be offsetting many of the large one-year declines. Furthermore, other rural hospitals showed volume declines in excess of 5% about as often as SCHs, indicating that rural hospitals in general, and not SCHs in particular, frequently suffer large drops in utilization.

FIGURE 4-1. FREQUENCY DISTRIBUTION OF OCCUPANCY RATES, SCH vs. OTHER RURAL AND URBAN HOSPITALS, 1981



SCH vs. OTHER RURAL AND URBAN HOSPITALS, 1977-81



Urban hospitals are far less likely to have large annual swings in volume in either direction. Only 13% of the urban changes were less than -5% with practically none more than -15%. Many urban hospitals already enjoy very high occupancy rates, which constrains the potential number of large volume increases. They also serve a much denser population base, which statistically reduces the importance of random fluctuations in admissions on the downside (Phillip, et al., 1984).

Are SCHs "uniquely vulnerable" to wide volume swings, as Congress assumed in giving them the 5% volume decline protection? The answer is yes, but only for very large declines beyond 10%. Based on t-tests of the frequency of declines, SCHs were no more likely to have a volume fall than other rural hospitals, and while they were statistically more likely to have a fall of at least 5%, the difference was trivial, i.e., a couple of points around 25%. Only when a 10% threshold is applied do we find SCHs more likely to have a "unique," statistically significant, volume decline, i.e., 15% of SCHs vs. 10% of rural hospitals generally.

One-in-four SCHs showing volume declines in excess of 5% would be less disturbing if these were high occupancy hospitals. Such is not the case. Occupancy rates were highest among SCHs exhibiting the least volume change. Base period mean occupancy rates were only 40% for SCHs with more than a 20% fall in volume; 41% for SCHs with declines in the 15-20% range; and 51% for SCHs with declines of 5% or less. Occupancy rates were also low at the other extreme, however, with SCHs experiencing volume increases of 20% or more showing 37% base period occupancy rates. This inverted U-shape relation between occupancy rates and volume changes is also typical of other rural hospitals, except that their average occupancy rate is always about 10 points higher.

Because SCHs are about 20 beds smaller than other rural hospitals, we expected their volume fluctuations to be larger, percentage-wise, but adjusting for bedsize did not materially affect the results: SCHs were significantly more likely to have at least a 10% volume swing, plus or minus, even holding bedsize constant.

Besides their decidedly lower occupancy rate, two other statistics are worth mentioning. First, based on a very small number of SCHs with volume declines beyond 5% and also reporting financial data for 1980-81 (N=9 out of about 60), their average operating margin was -7.3%. This would indicate

rather severe financial distress if it were not for the fact that their average total margin, including income from all sources, was +3.1%. Other rural hospitals experiencing at least a 5% volume decline exhibited the same operating/total margin reversal, although the swing was not as pronounced--probably because of many more reporting hospitals offsetting outliers. It is also relevant that a similar profitability pattern was found among SCHs and other rural hospitals enjoying large volume increases, i.e., negative operating margins offset by positive (or at least improved) total margins.

The second important statistic concerns the inverse relation between volume swings and inflation in average cost per case: as volume declines become larger, the percent increase in costs rises. Any rural hospital, SCH or otherwise, experiencing a 20% volume decline had average costs per case rise about 35% in 1980-81, compared to only a 14-18% increase within the -5%/+5% admissions corridor. Conversely, SCHs and other rural hospitals with over a 20% volume increase had average costs rise only 2%. Given that SCHs are more prone to volume declines in excess of 10%, they will also be more likely to suffer from larger cost inflation per discharge. The converse is true, on the other hand, for SCHs enjoying large, offsetting volume increases. Thus, the fact that SCHs are more susceptible to large declines is only part of the picture, and the temporal pattern of offsetting positive swings is important to consider in making a complete and equitable policy decision. However, in recommending that the 5% threshold for the volume shelter be maintained, HCFA also considered the declining admission rates in rural hospital admissions since 1981.

4.5.5 Extent and Effects of Offsetting Annual Volume Variations

The time path of volume changes can affect the hospital's net revenue flows under certain sheltering methods. Consider two SCHs with identical base period admissions rates of 2,000 per year. Both hospitals experience a 10% admissions decline to 1,800 in 1984. Hospital A then maintains this rate for 1985 and 1986 while hospital B enjoys a temporary 20% jump in admissions in 1985 followed by a 17% decline in 1986, producing the same number of admissions in 1986 as hospital A.

Under PPS, both hospitals may be eligible for a volume adjustment in 1984, but only hospital B could be eligible again in 1986. Assuming HCFA found marginal costs equal to 60% of average admissions costs of $2,000, a 10% volume decline could entitle both hospitals to an $80 increase in their 1984 rate (or an equivalent total settlement) to cover their 40% fixed costs ($80 = $2,000(1-.6)(.10)).* If fixed costs were in fact 40% of each hospital's cost base, then this simple adjustment would just cover all fixed costs and neither hospital would lose money.

In 1985, neither hospital would receive any volume adjustment, but hospital B would enjoy $720,000 extra revenue (assuming a constant $2,000 rate) because of a 20% rise in admissions. If marginal costs associated with positive volume growth were also 60% of average costs, hospital B would enjoy a "profit" due to the proportional increase in total revenues. Then in 1986, any losses from its precipitous volume decline of 17% would be sheltered, or avoided, through a $136 dollar increase in its $2,000 fixed rate. The net effect of these adjustments could be to permit profits in hospitals with offsetting changes in volume.

Table 4-3 gives a cross-tab of the frequency of SCHs showing volume swings of plus or minus 5% or more over the 1977-81 period. Each hospital can have up to four annual swings beyond 5% in one direction or the other. According to the table, 45% of SCHs had no volume decline of more than 5% over the five year period (see column one, last line) while another 34% had only one decline of this magnitude. Conversely, 34% had no volume increase of more than 5% (see first line, last column).

The frequency in the upper left-hand-corner of the table indicates that 17% of SCHs (or 62 hospitals) never had a wide swing in utilization in either direction. Nine percent had one large increase and no large fall; 13%, two large increases and no large fall; etc. Reading across the top row of the table, 7% of SCHs had one large fall and no large increase while another 7% had two falls and no offsetting, large increase.

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*See below for further discussion of this formula. Moreover, the 60% marginal cost assumption ignores the regulation's stipulation that only fixed and semifixed costs other than those already reimbursed on a reasonable cost basis be included. As capital costs continue to be passed through as of December, 1984, their exclusion would raise the share of costs considered to be variable.

TABLE 4-3

FREQUENCY DISTRIBUTION OF SCH ADMISSIONS CHANGES IN EXCESS OF PLUS OR MINUS 5 PERCENT

Number of Positive Changes > 5%	Number of Negative Changes < -5%					
	0	1	2	3	4	Total Percent
0	17%	7%	7%	1%	2%	34%
1	9	14	8	1	-	31
2	13	10	3	-	-	26
3	5	3	-	-	-	8
4	1	-	-	-	-	1
Total Percent	45	34	17	3	2	100.0%

The cells in the middle of the table are of particular interest as they reflect the SCHs with the most frequent volume swings from year to year. Consider SCHs with one large decline (column 2). Fully 80% (27%/34%) of these hospitals also had at least one large increase and nearly 40% (13%/34%) had two large, offsetting increases. Even the majority of SCHs with two large declines (column 3) had at least one large increase as well, i.e., 11% of 17%.

Summarizing, over the 1977-81 period, 55% of SCHs would have been potentially eligible for volume protection at some point. Of these, the vast majority would also have enjoyed an offsetting, large increase in volume at some other time during the period. Indeed, roughly 3 in 10 SCHs potentially eligible for volume protection would have enjoyed at least two years of large volume increases. In these instances, they are likely to profit from a fixed reimbursement rate based on average costs, costs that far exceed marginal costs when occupancy rates are low.

4.6 Econometric Estimates of Marginal Costs

Next, we consider the relation between volume declines and changes in hospital costs. We begin by reviewing the econometric literature on the subject. This provides a method for estimating variable costs in SCHs and then simulating their volume declines and expected program outlays.

A very extensive literature on hospital cost functions provides important insights into the size and composition of marginal costs.* Marginal costs are those additions to total costs resulting from the production of an additional unit of service or product. In reviewing the major articles written in the 1970s, Lipscomb, Raskin, and Eichenholz (1978) found that:

- marginal costs as a percent of average costs (MC/AC) ranged from about 20% to 90% depending on the time period and measure of output;
- very short-run (monthly) marginal/average cost ratios were 21-27% (Feldstein, 1961);

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*Three excellent reviews of the literature focusing on fixed-variable cost ratios and/or the role of teaching can be found in Feldstein (1981), Lipscomb, Raskin, and Eichenholz (1978), and Sloan, Feldman, and Steinwald (1983).

- short-run (semi-annual) ratios ranged from 40-65% (Lave and Lave, 1970a); and
- intermediate (annual) ratios ranged from about 60-90% (Lave and Lave, 1970b).

Higher MC/AC ratios are expected over longer time periods as hospitals have more time to adjust to volume changes. (Uncertainty also plays a role in explaining lower ratios over the short run; see discussion by Friedman and Pauly below.)

Another important finding from the literature is the sensitivity of marginal costs to the volume unit. In general,

- marginal costs as percentage of AC are greater when admissions are the volume unit vs. patient days.

Specifically, Lave and Lave (1978, p. 554) found that

- an additional patient day costs 64 percent of average cost (with length of stay constant)... When length of stay increases, with other variables constant, each day increase in stay costs about 25 percent of average cost.

From their results, it would appear that MC/AC ratios based on admissions are 1.5-3 times greater than those for patient days.

Unbiased estimates of marginal costs critically depend upon holding casemix severity constant. If MC/AC ratios are derived from cross-sectional observations and hospital volume and severity are positively correlated (i.e., if larger hospitals treat more severe cases on average),* then marginal cost estimates will be upward biased if casemix is inadequately controlled for. This is because some of the higher costs associated with greater volume are really due to treating more costly cases. For our purposes, we are interested in marginal costs within institutions, holding casemix constant, for hospitals will automatically be paid more if casemix shifts to more costly DRGs.** It

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*Watts and Klastorin (1980), using 315 of 1,200 HCFA-sampled hospitals that subscribed to PAS, found bedsize and CPHA's Resource Need Index to be positively correlated .37. For an RNI based on Medicare patients alone, the correlation was .60.

**See Lipscomb, Raskin, and Eichenholz (1978, pp. 532-33), Watts and Klastorin (1980), Cowing and Holtmann (1983), and Sloan, Feldman, and Steinwald (1983) for recent reviews of the role of casemix in hospital cost analyses.

may also be important to adjust for the diversity of complex cases if broader scope leads to unused standby capacity (see Jaskow, 1980; Watts and Klastorin, 1980; and Horn and Schumacher, 1979).

Significant improvements in casemix measurement have been made in the last ten years, going from cruder proxies like facilities and services (Berry, 1970) and departments (Feldstein, 1967) to charge or cost-weighted diagnostic indices like CPHA's Resource Need Index (RNI) (Sloan, Feldman, and Steinwald, 1983) and DRGs (Watts and Klastorin, 1980; Pettengill and Vertrees, 1982). Unfortunately, few of these studies have estimated marginal costs, using instead a reduced-form model with casemix proportions but not output *per se*. Pauly's (1978) study, however, does provide one MC/AC estimate (= .70) based on 50 short-term California hospitals for 1975, holding Major Diagnostic Groups, *inter alia*, constant.

Friedman and Pauly (1983) extend Pauly's earlier work by considering differences in short- vs. long-run marginal costs that may be attributable to uncertainty.

> For econometric purposes, one may not assume that inputs were hired to produce, at lowest cost, the particular levels of output actually observed. Instead, one might assume that inputs have been hired to minimize *ex ante* expected costs. (p. 107).

Thus, MC/AC ratios may be low, not only because of lagged adaptive responses to volume changes due to fixed inputs, but also because administrators are uncertain whether the demand shift is permanent.* The authors estimate an average cost (AC) function of the form:

$$AC = a_0 + a_1(1/OCC) + a_2Q/q + \sum_j a_j X_j + U$$

where OCC = occupancy rate, Q = expected admissions, q = actual quarterly admissions, and X_j = vector of factor prices and product mix variables, coefficient a_1 gives an estimate of average fixed costs while a_2 = quasi-fixed costs for one quarter only. (a_2 is also the difference between

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*Friedman and Pauly's argument is identical to Milton Friedman's permanent income hypothesis which explains the low MPC estimates from cross-sectional observations by noting the large transitory income component out of which the household spends very little.

long-run (LMC) and short-run marginal costs, SMC.) The authors also allow for joint determination of length of stay and admissions, reflecting the possibility that when admissions are unexpectedly higher, stays are shortened.

SMC/AC estimates in Friedman and Pauly (1983) range from .38 to .58 while LMC/AC ratios are not different from 1.0. The first set of estimates are consistent with non-proportional adjustments to costs when volume changes; the second set implies proportional adjustments. Allowing hospitals only 40-60% of their marginal costs for a given percentage change in volume "cancels financial windfall gain or loss, [Friedman and Pauly, 1983, p. 112 argue], but lasting increases in demand may be met by lower quality, while lasting declines permit higher quality." Hence, the authors conclude that

> In view of our findings of nearly proportional cost change for expected (i.e., long run) demand changes, the simple alternative of proportional volume adjustment allows some short-run gains or losses, but these are essentially unexpected amounts having no incentive effect on resource allocation (p. 112).

Theirs is an argument, essentially, for no volume shelter. If volume falls 5%, reimbursers should lower the total cost base 5% as well, leaving average cost unchanged. This would admittedly produce short-run losses from uninsured fixed costs, but it is administratively simpler and encourages speedy adjustment to lasting declines in demand (Friedman and Pauly, 1983, p. 112). While harsh, this conclusion is primarily motivated by hospital requests to have costs adjusted based on quarterly volume changes. The authors provide an argument that short-run adjustments of this kind are inappropriate and unnecessary. If a non-proportional MC/AC adjustment, or shelter, is applied to a permanent volume decline, then regulators may inadvertently "prevent competitive changes in market share or redistribution due to differential population growth (p. 106)." This occurs when, for example, volume permanently declines 10% due to outmigration and reimbursement rates (based on average costs) are raised 5% to cover marginal costs. Eventually, all costs will become variable, producing windfall gains for sheltered hospitals; either this or protected hospitals never completely eliminate excess fixed costs. A subgroup of financially distressed SCHs may exist, however, who cannot survive even a single large annual decline, a point the authors recognize. These may well deserve volume protection, if they could be identified, for example, by negative total margins.

4.7 Asymmetrical MC/AC Ratios

Several authors (Lipscomb, Raskin, and Eichenholz, 1978; Friedman and Pauly, 1983) have noted the possible asymmetric response of hospital administrators to volume declines vs. increases. Under cost-based reimbursement, administrators may be quicker to raise costs when admissions increase than they are in reducing costs on the downside.

To examine this "ratchet" hypothesis, we ran the following pooled regression:

$$\% \ \Delta \mathrm{COST}_{it} = a(\% \ \Delta \mathrm{ADM})_{it} + \sum_{t} b_t T_t + e_{it} \qquad (4.1)$$

where $\% \Delta$ COST = the annual percent change in total expenses for the i-th hospital in year t; $\% \Delta \mathrm{ADM}_{it}$ = the percent change in admissions; T_t = time dummies for t = 1978-81; and e_{it} = error term. Coefficient a represents the elasticity of costs with respect to admissions, or the MC/AC ratio. To determine whether this elasticity varies with the sign and size of the volume change, eq. (4.1) was estimated separately for four groups: (1) $\% \Delta \mathrm{ADM} > 5\%$; (2) $0\% <= \% \Delta \mathrm{ADM} < = 5\%$; (3) $-5\% < \% \Delta \mathrm{ADM} < 0\%$; (4) $\% \Delta \mathrm{ADM} < -5\%$. All hospitals are categorized by one of these groups with no SCH distinction.

The results are given in Table 4-4. Column 1 gives the mean percentage change in admissions in the group while column 2 provides the elasticity estimate. The other four columns give the average annual percentage change in cost per admission, holding volume change constant.

The elasticities are quite consistent with the rest of the literature, implying that

- a greater percentage of costs are variable for a larger volume change;
- MC/AC ratios are greater for volume increases than for decreases;
- for small admissions declines of 0 to -5%, costs fall only .17% for every 1.0% fall in volume; and
- for large volume declines of more than 5%, costs fall about .4% for every 1.0% fall in volume.

Thus, for small volume declines, it would appear that practically all costs are considered fixed over a year's time while for declines in excess of 5%

TABLE 4-4

COST-VOLUME REGRESSION ELASTICITIES

Percent Change in Admissions	Mean Volume Change (%)	Elasticity(a) (%)	Average Inflation Rate (b_t) in Total Costs (%)			
			1978	1979	1980	1981
5%	12.6%	.82%	.09%	.11%	.12%	.16%
1% to 5%	2.4	.68	.12	.12	.15	.17
-5% to 0%	-2.2	.17[a]	.12	.12	.15	.16
-5%	-11.0	.39	.12	.14	.15	.18

[a] Significant only at 7% level. All other coefficients significant at 1% level.

only about 60% are fixed. Whether such rigidity reflects true production and cost relationships or is simply a matter of the "ratchet incentive" of cost-based reimbursement is unknown.

4.8 Simulations of Expected Payments for Volume Declines

It would be useful for policy and budgeting purposes to have some estimates of the expected cost of the SCH volume shelter. A precise estimate is impossible because we do not know each SCH's volume patterns or circumstances *ex ante*. Present decisions are made by HCFA's Office of Reimbursement Policy based upon individual analysis of which costs are fixed or semifixed, which costs are necessary to maintain core services and staff, and whether volume declines truly were due to extraordinary circumstances beyond the hospital's control. What we can do is carry out a simulation analysis using past data on volume declines and various MC/AC assumptions.

4.8.1 Simulation Methods

We begin by creating an adjustment (ADJ) to the SCH's average payment rate that would compensate it for volume declines in excess of 5%. (A 10% threshold is also simulated.) Let

$$\Delta TC_i = \left[\frac{TC}{DIS}\right] . \Delta DIS_i$$

be an estimate of the decline in total costs of the i-th SCH (ΔTC_i) due to a given decline in discharges (ΔDIS_i). The ratio in brackets is the expected marginal costs associated with the volume change. For marginal costs below average costs, volume declines imply less-than-proportionate cost declines. Revenues, however, decline proportionately assuming a fixed payment rate. To adjust next period's rate to compensate for uncovered fixed costs, we calculated the following (approximate) adjustment

$$ADJ_t = ACDIS_{t-1}(e-1)(\%\Delta DIS)_t$$

where $ACDIS_{t-1}$ = last period's average cost per discharge; e = the MC/AC ratio; and $\%\Delta DIS_t$ = the percent change in discharges, assumed in excess of -5% or -10% in nominal terms. For example, if an SCH's average total costs

were $2,000, and its discharges fell 10%, the positive adjustment to next period's rate would be ADJ = $80 = $2,000(.6-1)(-.10), if we assumed 60% of costs were variable, or 40% fixed. The adjustment varies inversely with the MC/AC ratio and directly with the size of the volume decline.

The $80 hypothesized adjustment, if applied to every admission in the subsequent year, would just cover the 40% of costs assumed fixed for at least one year. Because of the statutory provision that Medicare is only liable for its share of incurred costs, the adjustment would be applied to Medicare discharges only. Expected program outlays can be approximated as

$$\text{TMED\$}_t = \sum_{j}^{N_j} (\text{ADJ})_{jt}(\text{MEDDIS})_{jt}$$

where $\text{TMED\$}_t$ = total Medicare outlays for the SCH volume shelter in year t; ADJ_{JT} = volume adjustment for the j-th eligible hospital in year t; MEDDIS_{jt} = total Medicare inpatient discharges from the j-th hospital. SCH-specific outlays are summed across all N_j hospitals eligible for protection to produce a total estimate. If Medicare discharges are roughly 1/3 of total discharges, then approximately 1/3 of the uncovered fixed costs would be picked up by Medicare in the ensuing period.

In simulating the dollar effects for 1984, the first year under PPS, we had to make assumptions about inflation in the two years between the last year of our series, 1981, and the base year of PPS, 1983. In 1982 we assumed average costs in SCHs rose 15%; or slightly more than in the 1977-81 period, dropping to 11% in 1983. These percentages are based on HCFA calculations, found in the August 31, 1984 Federal Register. Capital costs are to be reimbursed separately during the transition, so we have arbitrarily reduced average costs by 6.5% to account for this fixed cost carve out.*

The simulations were performed for 1984 based on observed volume changes between 1980 and 1981, using five different MC/AC ratios: 0.0, .7, .6, .5 and .4. Where MC = 0, all costs are presumed fixed, and the hospital would

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*The 6.5% figure is reindexed to total costs based on a national average 7% ratio of capital to operating costs alone. If SCHs have lower ratios because of a simpler service mix, then our cost base should be slightly low.

receive a proportionate increase in its payment rate for a given percentage fall in discharges. If at the other extreme all costs were deemed variable, no adjustment would be allowed. The literature suggests ratios between .40-.70, however, which seem reasonable. We have included the equal proportionate offset (e = 0) for illustrative purposes as an upward bound on Medicare outlays.

4.8.2 Simulation Results: 5% vs. 10% Declines

Table 4-5, panels a and b, present the simulation results. Column 1 gives the average adjustment to next period's rate required to cover fixed costs. Column 2 puts this adjustment in percentage terms. Columns 3 and 4 provide estimates of total outlays under alternative assumptions of the number of SCHs experiencing large declines. From 1977-81, about 1/4 of all SCHs had volume declines in excess of 5%, but for 1980-81 the rate was somewhat reduced (approximately 17%). One-quarter of 350 SCHs is about 90 hospitals while 17% represents 58 hospitals. If the likelihood of a large volume decline were uncorrelated with total admissions, then we could simply multiply the adjustments in column 1 by mean SCH Medicare admissions and the number of SCHs with "large" declines. Preliminary runs indicated that volume declines were inversely correlated with SCH size; hence the total outlays shown in column 4 are about 1/3 lower for this reason. The figures in column 3 based on a larger historical number of hospitals were simulated by factoring up the numbers in column 4, e.g., 90/58. Twenty-eight rural SCHs had volume declines in excess of 10% in 1981 vs. roughly 55 in the average year between 1977 and 1981.

If marginal costs were assumed zero, then mean payment rates would have to be raised $232, or 10.7% of average costs, for SCHs experiencing volume declines greater than 5%. For the 58 hospitals reporting such declines in 1981, this amounts to $6.3 million in additional Medicare payments. If 90 hospitals were to experience such declines, the number would rise to $9.7 million.

TABLE 4-5a

SIMULATIONS OF COST EFFECTS OF SCH VOLUME PROTECTION: 5 PERCENT CORRIDOR

MC/AC Ratio	Average Adjustment (ADJ) Per Admission (1)	Average Adjustment (ADJ) Percentage of Average Cost (2)	Total Medicare Outlays[a] based on 90 Hospitals (1977-81) (3)	Total Medicare Outlays[a] based on 58 Hospitals (1981) (4)
0%	$232	10.7%	$9,744,553	$6,278,707
40%	139	6.4	5,846,732	3,767,224
50%	116	5.4	4,872,277	3,139,354
60%	93	4.3	3,897,822	2,511,483
70%	70	3.2	2,923,366	1,883,612

TABLE 4-5b

SIMULATIONS OF COST EFFECTS OF SCH VOLUME PROTECTION: 10 PERCENT CORRIDOR

MC/AC Ratio	Average Adjustment (ADJ) Per Admission (1)	Average Adjustment (ADJ) Percentage of Average Cost (2)	Total Medicare Outlays[a] based on 90 Hospitals (1977-81) (3)	Total Medicare Outlays[a] based on 58 Hospitals (1981) (4)
0%	342	15.4%	$7,078,458	$3,604,103
40%	205	9.2	4,247,075	2,162,462
50%	171	7.7	3,539,228	1,802,051
60%	137	6.1	2,831,383	1,441,641
70%	103	4.6	2,123,538	1,081,231

[a] Column 4 simulated by first determining each hospital's specific adjustment, then multiplying by its actual Medicare days and finally summing across all SCHs eligible for protection. Column 3 derived by applying hospital relative frequency (e.g., 90/58) to column 4.

Outlays fall rapidly as a higher percentage of costs are assumed variable. At 50% variable, for example, expected outlays on one-quarter of SCHs would be half as much, or about $5 million. Federal Medicare hospital outlays in 1984 were roughly $35-40 billion; thus, a $5 million SCH volume shelter would cost about 1 one-hundredth of 1 percent of outlays, a relatively minor amount. Over the three original year transition period, this number would likely fall short of $20 million, even allowing for declining utilization in recent years. Indeed, if one-half of all SCHs had 5% volume declines in 1984, the annual outlay would probably run no more than $10-18 million; still a miniscule portion of the overall budget.

Of course, these adjustments would mean a great deal to those SCHs experiencing declines. At 50% variable costs, the $116 adjustment per admission would amount to roughly $54,000 per hospital, or 2% of the average SCH's projected average costs.

For those interested in the expected frequency and outlays associated with a 10% threshold, the figures in panel "b" of Table 4-5 are provided. Twenty-eight hospitals reported at least a 10% decline in 1981 while 55 would have been predicted in the typical year between 1977 and 1981. Comparing the results to the 5% threshold, the outlays appear to run about 60-70%, or somewhat more than the differences in relative frequencies. This is because the 10% threshold group are more "needy", requiring a larger percentage adjustment to cover a larger amount of uncovered fixed costs.

4.9 Volume Adjustments in Practice

Consider next the feasibility of applying a formula like the one just used in our simulations to actually pay SCHs for volume declines. Two regulatory entities have developed formulistic volume adjustments based in part on the empirical literature, viz., the federal Cost Of Living Council (COLC) from 1971-74 and several state hospital rate-setting commissions (on-going). We briefly review the methods used and problems each have had in this area, concentrating on New York State as the most comprehensive example of a state-specific methodology.

4.9.1. Cost of Living Council (COLC)

Under Phase II of wage-price controls, COLC used a proportional volume adjustment, implicitly assuming all costs were variable as volume changed (Lipscomb, Raskin, and Eichenholz, 1978, p. 516). This created strong incentives for volume expansion and imposed severe financial penalties for volume contraction. Under Phase IV, a more flexible approach was used that

- included the use of admissions as a measure of hospital volume;
- separated controls for inpatient and outpatient services;
- included a cost add-on for more complex patient mix; and
- assumed marginal costs based on annual admissions were on average 40% of hospital average costs (pp. 521-2).

The 40% MC/AC factor was further qualified by a "zone of no adjustment" for large and small hospitals. For under-100 bed institutions,

- all costs were assumed variable for admissions increases of 0-4%; above 4%, the 40% MC adjustment to costs applied; while
- all costs were assumed fixed for volume declines up to 10%; beyond 10%, the hospital was required to deduct 40% from prior year's average cost per admission for every admission below the -10% zone; beyond a 20% increase in average costs due to volume declines, the reimbursement rate was capped. (p. 526)

For over 100-bed hospitals, the 100% fixed cost assumption was applied only to admissions declines of 5% or less.

The zone of no adjustment essentially provided 100% cost sheltering for volume declines within 5-10% corridors for large and small hospitals, respectively.* The corridors were narrower on the positive side to avoid making rate changes for minor volume changes. While one can debate how broad the corridors (sheltering) ought to be, it is important to emphasize the precedent in applying unobtrusive, formulistic volume adjustments at the federal level that assume marginal costs roughly one-half of average costs.

4.9.2 Volume Adjustments in New York

New York's Prospective Hospital Reimbursement Methodology (NYPHRM, 1983) uses an even more sophisticated algorithm for volume adjustments. The key difference comes from a distinction between the variable cost ratios by source, either length of stay (LOS) or discharges.** Their methodology first decomposes the volume changes by LOS*** and discharges, then weights each component's change by established fixed/variable cost ratios. Algebraically,

$$\Delta \text{ DAYS} = (\Delta \text{ LOS})(D_o) + (\Delta \text{ D})(\text{LOS}_t)$$

$$= \Delta \text{ DAYS}_{\text{LOS}} + \Delta \text{ DAYS}_{\text{D}}$$

$$\text{TC} = \text{FC}_{\text{LOS}} (\Delta \text{ DAYS}_{\text{LOS}}) + \text{FC}_{\text{D}}(\Delta \text{ DAYS}_{\text{D}})$$

where Δ DAYS = the change in total inpatient days; Δ LOS, Δ D = change in average length of stay and number of discharges, respectively; D_0, LOS_t = base period discharges and end-period LOS, respectively; $\Delta \text{ DAYS}_{\text{LOS}}$, $\Delta \text{ DAYS}_{\text{D}}$ = net change in total days attributable to changing stays and discharges; Δ TC = expected change in total cost base accompanying the volume change; and FC_{LOS}, FC_{D} = fixed cost ratios ascribed to changing LOS and

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*This, of course, is the opposite of that proposed by Congress which gives no shelter for small declines.

**Although we do not know for certain, it would appear that distinguishing between LOS and discharge-based marginal costs came from research by Lave and Lave (1978).

***LOS changes are also screened for casemix changes to avoid arbitrary increases in stays not related to a more severe casemix.

discharges. The fixed cost ratios vary discontinuously by the percent change in patient days according to the following table:

% Change	LOS Ratios (Δ DAYS$_{LOS}$) FC/VC	Discharge Ratios (Δ DAYS$_D$) FC/VC
0 to 5%	80/20	
0 to 6%		60/40
5+ to 7%	75/25	
6+ % or more		50/50
7+ to 10%	70/30	
10+ or more	65/35	

For changes in volume due to lengths of stay up to plus or minus 5%, 80% of costs are assumed fixed and only 20% variable. Fixed cost coefficients fall to 75%, 70%, and finally to 65% for changes of 10% or more. For volume changes attributable to discharges, the fixed cost ratios are lower to begin with, and only distinguish between small (6% or less) or large (6%+) volume changes. The sliding percentage recognizes the direct relationship between the size of the change and the variability of costs while the LOS vs. discharge distinction recognizes the lower marginal (variable) costs associated with shortened (lengthened) stays vs. an entire admission.

For example, assume length of stay fell from 10 to 9 days on an unchanged 1,000 discharges, implying a fall of 1,000 days. In a 50 bed hospital, this would result in an occupancy decline from 54.8% to 49.3%. The overall volume decline is 10%, which is then pro-rated across the various fixed coefficients using the base period per diem. Assume a \$200 per diem, giving a hospital cost base of \$2,000,000 (= 10,000 days @\$200 per day). The pro-rated formula gives the following volume carve-out:

$$\begin{aligned}\$\,\Delta\,\mathrm{VOL}_{LOS} &= \$200[-500(.2) - 200(.25) - 300(.30)]\\ &= \$200[-240] = -\$48{,}000.\end{aligned}$$

The first 500 days, or 5% of 10,000, are adjusted by a 20% variable cost factor; the next 200 days between 5% and 7% decline, a 25% VC factor; and the

last 300 days between 7% and 10% decline, a 30% VC factor. The expected decline in operating costs due to a 10% LOS volume decline is $48,000, or 2.4% of base year costs. This would produce a revised per diem of $2,000,000-$48,000 = $1,952,000/9,000 = $216.89. In other words, to produce an allowable budget of $1,952,000 on 9000 days, the hospital would have to be reimbursed at the rate of $216.89. This rate would shelter the hospital against uncovered fixed costs due to the volume decline, leaving only $48,000 in variable costs uncovered.

If the same 1,000 day decline had come through 100 fewer discharges, the variable cost adjustment would have been

$$\begin{aligned} \$\Delta \mathrm{VOL}_D &= \$200(-600(.4) - 400(.5)) \\ &= \$200(-440) = \$88{,}000, \end{aligned}$$

producing a revised per diem of $2,000,000-$88,000 = $1,912,000/9,000 = $212.44. As more costs would be considered variable, the sheltered budget falls to $1,912,000, and the revised per diem increases only $12.44.

4.10 Conclusion

SCHs are more likely than other rural hospitals to experience large volume swings, especially for declines in excess of 10 percent. Based on past experience (which may understate declines given recent experience), HCFA might expect about one-eighth, or 45 SCHs, to apply annually for volume protection at the 10% threshold, which could cost between $2.5 and $5 million a year, depending on the amount of costs assumed fixed. However, program experience thus far has shown that very few SCHs apply for volume protection even at the 5% level.

5.0 ANALYSIS OF THE REIMBURSEMENT METHOD FOR SOLE COMMUNITY HOSPITALS

5.1 The Reimbursement Formula for SCHs

Hospitals that are designated as Sole Community Hospitals will be reimbursed at 75 percent of the hospital-specific rate and 25 percent of the federal rate indefinitely. This method largely protects hospitals from a decline in payment levels that might result from use of the federal rate. However, the hospital-specific rate does not represent an extraordinary payment or subsidy as compared to an individual hospital's historical costs. And the reimbursement formula also will not protect an SCH from higher average costs that might result from declining occupancy rates. Finally, the 25 percent federal rate will encourage these higher cost hospitals to reduce costs.

There is wide variation in costs among Sole Community Hospitals. Consequently, some might find the federal rate to be greater than their hospital-specific rate. In these situations the hospitals may find it more to their advantage to opt out of SCH status. However, the PPS regulations make it very difficult, and in many cases impossible, for a hospital to return to sole community status after electing to opt out. As a result, hospitals will want to carefully weigh their expectations about future reimbursement alternatives before making such a decision.

Such a decision would most likely hinge on long-run considerations. However, important aspects of the future of the prospective payment system after the phase-in period are not clear with regard to sole community hospital status in particular, and with regard to some aspects of the basic system itself. The most important characteristics for this section are the updating factors to be applied to the average cost per discharge and any adjustments that may be made to these averages in pursuit of such goals as budget restraint or budget neutrality.

During the phase-in period, both the hospital-specific and the federal rates are being updated by the same amounts. The budget neutrality adjustments for 1984 and 1985 use the same equations, but as is indicated in the Federal Register [(49:171) August 31, 1984, pp. 34975-76], the results can differ slightly. After the phase-in period, the hospital-specific rate will be applicable only to SCHs. It is therefore possible, even if unlikely, that differential treatment of SCHs and non-SCHs for inflation or budget restraint

may be introduced into the system. Consequently, SCHs may not want to make their decisions about opting out solely on the basis of current cost calculations, preferring instead to conserve their options until the future structure of PPS is clearer.

5.2 Simulation of Hospitals Who May Opt Out of SCH Status

5.2.1 Simulation Methods

The decision whether a hospital should apply for Sole Community Hospital status or opt out of such status depends on a number of factors. However, the most important factor will be the expected level of reimbursement under the hospital-specific rate versus under the federal rate. It is impossible to predict these levels for the period after the phase-in of PPS. However, it is possible to estimate these differences for the most recent period for which data are available. The analysis was performed for rural hospitals only, given that urban SCHs are only a small minority and that there is no mechanism to designate new urban SCHs.

Data from 1981 were used to estimate hospital-specific and state-level adjusted average costs per admission. In both cases, to the greatest degree possible rate calculations paralleled those used by the PPS.

Hospital Specific Rates. For each hospital, Medicare costs were divided by Medicare admissions in order to obtain an average cost per admission. This average cost was then standardized for casemix by dividing by the CMI. Finally, under current law, the average was standardized for indirect medical education costs by dividing by the adjustment contained in the PPS regulations:

$$\text{indirect teaching adjustment} = 1 + (.1159)\ \frac{I + R}{\text{beds}} \times 10$$

where I + R = interns and residents, beds = total hospital beds, and .1159 = double the education adjustment factor.

Federal Rate. After the phase-in period of PPS, there will be one national adjusted standardized amount for rural areas. However, the labor-related portion of this amount will be multiplied by a wage index that has a different value for each state. Furthermore, for hospitals in Alaska and Hawaii the nonlabor-related portion will also by multiplied by a

cost-of-living adjustment factor. As a result, rural hospitals in each state can face different values for the federal rate.

We approximated these different federal rate values by taking state averages of the hospital specific rates described above. For the labor-related portion of costs this approach will be the same as first standardizing for differences in wage levels to obtain the federal standardized amount, and then multiplying this amount by the appropriate rural index for each state. For the nonlabor-related portion of costs, this approach will produce greater variation in state-level values of the federal rate for rural areas than would actually occur in the PPS calculations (except for Alaska and Hawaii). However, the variation should not be substantially greater, and alternative simulations that were run indicated that the results of a more accurate treatment of nonlabor-related costs would be similar to those presented here.

Adjustments could not be made for other aspects of hospital costs. For example, data were not available for direct teaching costs, which are excluded from the prospective payment system. However, as was shown in Chapter 2, almost no rural hospitals engaged in substantial teaching activities. Consequently, the adjustment of costs for these teaching activities is not likely to be important.

Capital-related costs are also excluded from PPS, but it was not feasible for us to adjust the simulations for this exclusion. It is not clear what, if any, bias is introduced by this limitation. Table 2-7 indicated that rural SCHs are slightly less likely than other rural hospitals to provide more sophisticated services that may require higher levels of capital outlays. However, SCHs also have lower occupancy rates, which result in higher capital costs per admission, assuming all other factors are held constant.

5.2.2 Simulation of Differences Between Hospital-Specific and Federal Rates for SCHs

After an adjusted cost per Medicare admission was calculated for each hospital and each state, the cost for each Sole Community Hospital was compared to the average rural cost for its state. This comparison for 1981 may not be the same as the actual comparisons that will face SCHs in the future, when considering whether to retain the 75% hospital specific payment

or opt for the regular federal rate. However, it is expected that the greater the amount by which the estimated federal rate exceeds the estimated hospital-specific rate in this simulation, the greater the probability that a Sole Community Hospital will opt out of SCH status.

Table 5-1 provides information on the distribution of percentage differences between the adjusted average cost per admission for each SCH and its state adjusted average cost per admission. The mean value of this difference for the 305 rural SCHs for which data were available is +6.9 percent. This figure supports the widely held view that SCHs are generally more expensive than rural counterparts in their state, holding casemix constant. However, there is a wide range of values behind this simple average. Ten percent of the SCHs have costs that exceed their state-level average by more than 40 percent, and 25 percent of SCHs have costs that are higher by more than 20 percent. Such high cost hospitals can almost certainly be expected to retain SCH status, in which they can continue to be reimbursed on the basis of their historical costs.

TABLE 5-1

DEVIATIONS OF ADJUSTED AVERAGE COSTS PER ADMISSION OF SCHs FROM REGIONAL AVERAGES

Percentile threshold	Percentage Deviation from Regional Average
90%	41.8%
75	20.4
Mean	6.9
Median	3.7
25	-13.9
10	-24.9

Some of these high cost SCHs have average costs for all admissions that are not much greater than the state average, even though their adjusted average cost per Medicare admission is substantially higher than the adjusted

state Medicare average. In these instances it may be the case that the hospital is acting in part like a long-term care facility for some of its Medicare patients. Alternatively, in 1981 the hospital may have had a few very expensive Medicare cases which, given that many SCHs are quite small, had a substantial impact on the average cost per Medicare admission.

Ten percent of the SCHs had costs that fell below their state averages by an amount exceeding 24 percent. These hospitals will almost certainly opt out of SCH status in order to receive 100 percent of the federal rate that is well in excess of their historical costs.

Rural SCHs are not evenly distributed across the country. It is therefore worthwhile to analyze the regional distribution of SCHs whose costs are less than their state averages, and who therefore have a greater probability of opting out of SCH status. Table 5-2 presents data on those rural SCHs whose adjusted cost per admission is more than 5 percent less than the adjusted state-level cost. Out of 305 SCHs for which there were sufficient data to make the calculations, approximately one-third had costs that were below their regional rate by at least 5 percent. For each of the three regions that contain the majority of sole community hospitals, West North Central, Mountain and Pacific, the percentage of SCHs with lower costs is approximately the same as the national average.

These results indicate that there may be a substantial number of hospitals who are eligible for Sole Community Hospital status but who may find that the federal rate for their region provides a greater reimbursement amount. Whether they, indeed, choose to opt out and give up the volume protection as well remains to be seen. For those that do, their revealed behavior will indicate particularly favorable reimbursement. It also will reflect greater federal assurance of beneficiary access in these rural areas. However, administrative simplicity suggests that after the transition, the federal portion of the rate blend for SCHs should be the national rate, rather than maintaining the nine separate regional rates only for this limited purpose.

TABLE 5-2

DISTRIBUTION OF RURAL SCHs WITH COSTS BELOW THEIR STATE RURAL AVERAGES

	All SCHs[a]	SCHs with Adjusted Costs Less Than 95% of Regional Average	Lower Cost SCHs as Percent of All
Region			
Northeast	5	5	100%
Mid-Atlantic	0	0	--
South-Atlantic	15	6	40
East North Central	8	2	25
East South Central	11	2	18
West North Central	50	17	34
West South Central	29	6	21
Mountain	115	47	41
Pacific	62	23	37
	305	108	35%

[a] Excludes rural SCHs for which data were not available for these specific calculations (approximately 5% of sample).

Sources: American Hospital Association Annual Survey of Hospitals, Medicare Cost Reports, and Area Resource File.

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APPENDIX A

DATA SOURCES AND METHODS

A.1 Introduction

This appendix contains a description of the sources, construction and contents of the data base that was used in this report. The mandate for this report required that a wide range of issues be covered, necessitating the compilation of data for hospitals, not just on Medicare beneficiaries, costs, and payments, but also on local area characteristics, scope of services, and non-Medicare financial and utilization variables. With the exception of some financial variables, the data presented in this report were not derived from a sample of hospitals, but rather from an actual census of hospitals that are covered by the Prospective Payment System (PPS). Most of the analysis and data are for the year 1981, although for certain sections data for the earlier years 1977-80 are used.

A.2 File Construction

Three primary sources were merged to construct the analytical file: Medicare Cost Reports, the Area Resource File, and the American Hospital Association Annual Survey of Hospitals. For all three sources, data were available for the years 1977-81. The Medicare Cost Reports (MCR) contain the hospital characteristics and financial and utilization data that are provided by hospitals in order to obtain payment for treating Medicare patients. The Area Resource File (ARF) provides data on a variety of local area characteristics at the county level. The American Hospital Association (AHA) Annual Survey of Hospitals provides detailed information on admissions, costs, ownership, types of service, and personnel for responding hospitals.

Finally, in order to provide more detailed analysis of the financial status of hospitals, data were utilized from the Abt Associates rate-setting masterfile. These data are derived from MCRs for all hospitals in 15 rate-setting states, plus a one quarter random sample of all U.S. hospitals.

Hospitals that are excluded from the coverage of PPS were also excluded from the analytical file. The primary excluded hospital types are:

psychiatric, rehabilitation, alcohol/drug treatment, children's, and long term care. A few other hospitals amounting to less than a half of one percent of the original number on the file, were eliminated because they had missing or incorrect data for several important variables, such as case mix index, total or Medicare expenses, or total or Medicare admissions. (See section A.4.1)

A.3 Defining Sole Community Hospitals

The designation of Sole Community Hospitals (SCHs) come from three sources. Approximately 260 SCH designations were taken from the Medicare Cost Report data. These are the ones that were designated under the Section 223 cost limits and were grandfathered into PPS. An additional 104 designations were provided by the Bureau of Program Operations, DHHS, to make the list of SCHs current through July 1984. This last group represents designations made under the Prospective Payment System.

A.4 Variable Definitions and Cleaning

This section describes the variables used for the empirical work in this study, their sources, any limitations, replacement of values and cleaning. For exposition purposes, the variables are grouped into broad categories: utilization vs. costs, etc.

A.4.1 Hospital Location, Ownership, Teaching Status

A hospital's location was determined in two ways. First, it was designated an "urban" hospital if there was an SMSA number in the AHA data. Otherwise, the hospital was "rural". The AHA variable designating the SMSA had far less missing data than did the Medicare SMSA variable. Even so, additional checks uncovered approximately 100 hospitals that were miscoded and these were corrected. A hospital was also located in a state and census region using its provider identification number from the MCR data. There were no missing data on this six-digit variable, whose first two numbers give the state.

A hospital's ownership and one measure of teaching status were obtained from the Medicare Cost Report. The designations of "church" and "other voluntary non-profit" were combined as "Private Non-profit" for use in

descriptive tables. To determine a hospital's teaching status, the number of interns and residents was obtained from the MCR and divided by the number of beds available at the end of the reporting period (also reported on the Medicare form).

Other measures of teaching involvement and a hospital's JCAH accreditation were taken from AHA data.

A.4.2 Market Characteristics

Most of the characteristics of the county in which a hospital was located (presented in Table 2-2) were obtained from the Area Resource File, a data set compiled and maintained by the Bureau of Health Professions of the Department of Health and Human Services. The exceptions were the number of acute care hospitals in the county and the number of hospital beds. Both of these were constructed from the MCR data by summing the number of acute care hospitals and beds in these hospitals within each county.

The area wage index is from the Federal Register.* It was matched to each hospital using the AHA SMSA code or state code.**

A.4.3 Size and Utilization Statistics

The three measures of a hospital's bedsize were obtained from the 1981 Medicare Cost Report. They represent the number of inpatient beds available at the end of the reporting period. The number of inpatient days for all patients and for Medicare patients were also taken from the MCR.

The number of admissions were used instead of the number of discharges. This was due to errors in the available discharge data that apparently overstate both total discharges and Medicare discharges by 50 percent on average. This is a very large discrepancy so the choice of admissions could

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*Federal Register/Vol. 49, No. 171/Aug. 31, 1984/Tables 4a & 4b, pp. 34777-34779.

**More precisely, if a hospital was "rural" and had no SMSA code, it was assigned the rural index for its state. Each urban hospital was matched to its index number by SMSA. Approximately 100 hospitals with no SMSA designation in the dataset were matched by hand.

make a difference in the empirical work. Admissions were preferred over discharges for several reasons. First, MCR discharges produced average costs per discharge that seemed unreasonably low, while Medicare admissions produced much more reasonable average costs. Second, the time trend of admissions for a given hospital appeared more consistent than for discharges. Of the two choices in measuring total admissions, the AHA number (excluding newborns) was preferred because of less missing data, expecially for earlier years. Medicare admissions were taken from the MCR. The reporting period for the AHA survey differs slightly from that for Medicare. Therefore, the number of admissions is not measured over the same period as are inpatient days. This leads to a possible underestimate of average length of stay of about 2 percent. This was judged to be a smaller error than the possible overall error that would result from a smaller sample of hospitals due to missing values.

The number of full-time equivalent employees (FTEs) was obtained from the AHA survey data which again had more complete values. In addition, the survey provided additional measures of utilization, including the number of surgical operations, visits to the emergency room, and to outpatient departments.

A.4.4 Cost Statistics

The total cost for all inpatients was also obtained from the AHA annual survey, where it is called total expenses. This meant that it measures costs for the same reporting period as total admissions and avoids bias in the cost per admission. The AHA expense figure is for the total facility and includes the costs of emergency rooms, OPDs, and nursing home units from some 670 institutions. Because these long term costs are not paid for under Medicare but cannot be subtracted from the 1981 cost figures, the hospitals with nursing homes were flagged so that this source of additional cost could be controlled for in regressions. These hospitals were excluded from the descriptive means.

The Medicare cost figures were from the MCR. The figure used was called "Total Inpatient Cost Applicable to Title XVIII" and was reported on worksheet E, Part 1, Column 1, page 33, line 12 of the MCR. It includes depreciation and interest costs allocated to the various cost centers of the hospital, but excludes all uncovered Medicare services, e.g., maternity. It differs

from the AHA figure in two major ways. First, Medicare costs are only the fraction of total expenses corresponding to costs incurred by Medicare patients only. Second, all outpatient costs are excluded.

The figure for 1981 salaries was calculated from the AHA total expenses and total nonpayroll costs. Total nonpayroll costs includes employee benefits, professional fees and payments for contracted services in addition to depreciation, interest and medical supplies. Total expenses included salaries for medical doctors and residents. Residents salaries are reimbursed separately under PPS and should therefore be subtracted from total expenses. No correction for residents' salaries was possible, due to missing data. No cleaning or trimming of the values for salaries was done.

A.4.5 Financial Statistics

As part of HCFA's National Hospital Rate-Setting Study, Abt Associates collected MCR income and balance sheet data on four key financial ratios:

- Current ratio: Ratio of assets expected to be realized as cash within one year to obligations due as cash within one year, i.e., short-term assets over short-term liabilities;
- Long-term Debt to Net Total Assets: Debt obligations not due in less than one year divided by net (of depreciation) total assets;
- Operating Margin: Ratio of operating revenue minus operating expenses to total operating revenue; and
- Total Margin: Ratio of total revenue from all sources minus total expenses to total revenue.

The two margins reflect the hospital's "profitability", or financial performance on a current basis. The primary difference between the two is that the operating margin reflects only patient care revenues and expenses while the total margin includes non-patient revenues from donations, investments, the parking lot, as well as any additional expenses.

These statistics are available, however, for only a sample of U.S. hospitals used in the rate-setting evaluation. A one-quarter random sample of all U.S. short-term hospitals was drawn, then supplemented by every other short-term hospital in one of 15 rate-setting states. This produced about 2,500 hospitals for which financial data were potentially available.

Prior to constructing the ratios, the MCR data went through extensive cleaning. As a first step, all of the data were filtered through a series of accounting identities to insure internal consistency. Next, in some cases accounting identities could be used to impute missing values as well. Then financial ratios were constructed and printed to identify obvious outliers. Predetermined screens were then used to drop outliers. A 100% upward limit was applied to all four ratios; no negative screen was necessary.

After cleaning and other editing procedures were completed, financial data were available on over 1,400 hospitals in 1981, including 68 rural SCHs.

A.4.6 Scope of Services

The AHA in its annual survey asks hospitals to report whether they offer one or more of nearly 50 specialized services. We selected about 20 of the more complex or access-oriented services for analysis.

The major drawback of these 0, 1 codes is that they give no indication of how large a service it is or how underutilized it might be. To provide a more continuous measure of size, we used some MCR cost statistics on 5 special services: operating rooms (including operating room, recovery room, and anesthesia delivery rooms), all radiology (including diagnostic, therapeutic, and radiostope), all laboratory, and physicial therapy. Costs are defined as post-stepdown expenses to a particular department. We also took a total ancillary cost figure from the MCR report to measure the ancillary orientation of the institution.

A.4.7 Occupational Mix

Information on the number of workers in 22 occupational categories comes from the 1982 AHA survey of hospitals. The special survey also included numbers of contracted workers and vacancies for the same categories. There were complete data for 5,134 hospitals including 113 RRCs, 1,858 other rural hospitals and 2,108 urban hospitals. Approximately 40 hospitals were excluded because their reports were for less than a full year.

In calculating salaries, costs, and admissions, the values for 1982 were used. The designation as an RRC or other type of hospital and the wage index were merged from the 1981 described above.

A.4.8 Data Cleaning

The files for the years 1977 and 1981 were extensively examined in order to insure that the data contained reasonable information. Data that were determined to be unusable were either eliminated or, in a few cases, corrected. In this section we describe this process.

The data were examined by constructing a number of ratios for each hospital, such as:

Cost per admission
Cost per Medicare admission
Cost per day
Cost per Medicare day
Average length of stay
Occupancy rate
Surgical operations per admission
Ratio of Medicare admissions to total admissions
Personnel per bed
Percent of ancillary costs spent on a specific ancillary service
Ratio of ancillary costs to total costs.

For each of these ratios, approximately the top and bottom one percent of the distribution of values were examined. By examing a number of these ratios at the same time, it was possible to determine whether extreme values were valid, and therefore should be left in the file, or were invalid data that should be changed to missing. In some cases, the value of the ratio was so extreme that it clearly indicated bad data. For example, for one hospital the average length of stay per Medicare admission was found to be 135 days, an unrealistically high figure. In this instance, the percentage of admissions due to Medicare patients was calculated to be 2 percent, an extremely low percentage. As a result, it was concluded that the Medicare admissions figure was incorrect, and we set it to missing.

However, some extreme values did not obviously represent bad data. In these cases the values of other ratios were also examined to determine whether the flagged variable indicated the need to change a data value. For example, if for a given hospital the average cost of a Medicare admission was flagged

because it was extremely high, but not unbelievable, and the average cost of all admissions was also high, then the flagged value was allowed to remain. Suspicious values were also checked when possible with data presented in issues of the American Hospital Association Guide to the Health Care Field. In a few cases this allowed for the replacement of incorrect data with valid values.

In summary, data values were not eliminated simply because they were at the end of the distribution. For 1981, a total of 23 hospitals were eliminated from the sample because they had invalid values for a number of variables important to this analysis (and in many cases did not even have a hospital name or address). For all variables, a total of 20 values were changed to missing for hospitals that were retained in the sample.

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